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ABSTRACT

A looseleaf format allows for the easy addition of annual updates to this practitioner's handbook for planning educational facilities from the conception of needs through occupancy and use. Each unit contains numerous photographs, drawings, and figures that illustrate the contents. Unit subjects are as follows: historical perspectives; planning resources; developing a master plan; the planning professionals; educational specifications; the site; spaces for learning; auxiliary spaces; environment for learning; equipping the facility; project budget and cost control; financing the capital program; the construction program; renovation, alteration, conversion; orientation and postoccupancy evaluation; college and university planning; and buying, selling, leasing. A two-page index is appended. (MLF)

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GUIDE FOR PLANNING EDUCATIONAL FACILITIES

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The Council of Educational Facility Planners, International

1991

PLANNING GUIDE

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PREFACE

The Council of Educational Facility Planners, originally known as the National Council on School House Construction, began compiling information about school planning in the 1930s. The most widely used of its publications is the *GUIDE FOR PLANNING EDUCATIONAL FACILITIES*, issued in 1953, 1958, and 1964 as the *GUIDE FOR PLANNING SCHOOL PLANTS* and in 1969, 1976, 1983 and 1985 under its current name. The Guide is prepared by CEFPI members who have specific expertise in the topic they have written. Their work has been coordinated through the efforts of the Council's Guide Update Committee and Headquarters Staff.

This document is viewed as a practioners handbook for planning educational facilities. It can be utilized by a novice or a veteran. The Guide is comprehensive in scope and relates to educational facility planning issues facing professionals today.

The Council views the Guide as a valuable resource to the field of educational facility planning. Through its use, we hope to impact the quality of planning efforts worldwide.

Council of Educational Facility Planners, International
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PURPOSE

The Council of Educational Facility Planners, International, is a nonprofit organization of individuals and corporate groups whose professional activities involve a responsibility for planning, designing, creating, equipping, and maintaining the physical environment for education. The Council seeks to further the goals of education by providing services, activities, and information related to teaching and learning environments.

HISTORY

The National Council on Schoolhouse Construction was founded in 1921 to "promote the establishment of reasonable standards for school buildings and equipment with due regard for economy of expenditure, dignity of design, utility of space, healthful conditions and safety of human life."

The Council's influence has extended to include facilities for preschool, higher education, and lifelong learning, as well as elementary and secondary education. In 1965, membership opened to consulting firms in architecture, engineering, and educational planning. In 1967, the Council changed its name to the Council of Educational Facility Planners, reflecting the extended scope of membership and breadth of professional interest.

CEFPI expanded again in 1969 when membership categories were established for industrial firms, institutions and students whose interests and activities relate to educational facility planning. At the close of its first half-century in 1971, the word International was added to the Council's name to acknowledge its influence worldwide and to recognize its many members from beyond the North American continent.

PARTICIPATION

Council members meet annually, sharing their ideas and experiences, strengthening their professional expertise, and expanding their knowledge of educational facility planning and the planning process. The Council is decentralized into geographic regions making it possible for its members to participate in conferences and workshops where regional or local concerns may vary from international perspectives. Members are encouraged to participate at the international, regional, and local levels.

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UNIT A • HISTORICAL PERSPECTIVES

HISTORICAL PERSPECTIVES

Prepared by:
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HISTORICAL PERSPECTIVE

To understand the rationale for contemporary school house planning requires an examination of the historical perspective from which this rational has evolved. Historical building and classroom design tells us not only about the didactic methods used within them, but also something about the social and educational philosophy of the past. This unit chronicles the progress and considers the future of educational planning in North America.

COLONIAL PERIOD

Responsibility for the education of most colonial children rested within the hands of the church. A common belief among the early settlers was that every child must learn to read the Bible in order to gain salvation. Consequently, church buildings served to accommodate educational activities as well as religious functions. As time progressed and communities expanded, the one-room school house became the most common means of housing educational programs. These buildings, though crude in structure and lacking in ambiance, accommodated the pedagogy of the day for over 150 years.

AMERICAN SCHOOLS IN THE EARLY 19TH CENTURY

Schools changed as America changed. The schools kept pace as the country progressed from an agricultural economy to an urban industrial society. Drastic advances in communication, manufacturing, and transportation changed the lay of the land. New cities were carved from the wilderness west of the Ohio, forever altering the way of life of the American people. These changes were reflected in the organization, size and pedagogy of the schools (Educational Facilities Laboratories (EFL), 1960). While this evolutionary process of American life has determined the structural nature of our schools, there is little evidence that consideration was given to how the building should accommodate learning.

With the catechism as its model, the Lancastrian school system of England arrived in this country around the turn of the 19th century. The classroom facilities constructed to house the system were designed to accommodate great numbers of students of every grade and achievement level. It was not unusual, in city schools, to have 500 students seated in a single 50 feet by 100 feet room. The use of benches rather than desks allowed the room to accommodate one student for each 10 square feet of space (EFL, 1960).

Although the Lancastrian system survived in America for approximately 40 years, the influence it had on development of our educational system was substantial. Lancastrian rational established principles of group instruction and education for all children and provided a basis for the free tax supported public schooling we have today (EFL, 1960).

EARLY AMERICAN SCHOOL ARCHITECTURE

The Lancastrian system began to disappear during the 1830's, due in part to the ideas of Henry Bernard, Horace Mann, and several other celebrated educators of the day who contended that facilities were more than shelters. William Alcott, (cited in McClintock and McClintock, 1970) in his prize winning essay on the construction of schoolhouses, stated that the appearance of the classroom and the way in which it was arranged had extensive influence on forming the character of the students housed within. Henry Bernard, who was instrumental in early school building reform, painted a dismal picture of the condition of most pre-Civil War school houses (McClintock and McClintock, 1970):

> *They are universally badly located, exposed to the noise, dust and danger of the highway, unattractive, if not positively repulsive in their external and internal appearance, and built at the least possible expense of material and labor, (p. 31).*

Bernard, (cited in McClintock and McClintock, 1970) also quoted the New York Superintendent of Education who made the following statement to the New York State Legislature in 1844:

> *The total number of school houses visited and inspected by the county superintendent during the year was 9,368 of which 8,795 consisted of one room only. The number of these schools having no privy is 6,432 and the number that contained no suitable desks, etc., is 5,972. The number lacking in proper facilities for ventilation is stated at 7,889. It is in these miserable abodes of accumulated dirt and filth, deprived of wholesome air, or exposed without adequate protection to the assaults of the elements, with no facilities for necessary exercise or relaxation, no convenience for prosecuting their studies; crowded together on benches not admitting of a moment's rest in any position, and debarred the possibility of yielding to the ordinary calls of nature without violent inroads upon modesty and shame; that upwards of two hundred thousand children, scattered over various parts of the state, are compelled to spend an average of eight months during each year of their pupilage (p. 38).*

Bernard and other transcendentalists of the period felt that school buildings themselves should enhance the cultural task of the school. These early reformers saw this cultural task as being the development of manners, morals, and minds. Children were viewed as independent, rational persons who, while at school, should be developing high ethical and rational standards. These early reformers shared the point of view that it was important to ask children what they learned at school; however it was more important to ask them what they learned from the school house. During the period of the early 1800's the school house served as an example of an environment of spiritual degradation.

The transcendentalist minister John Sulliven Dwight, (cited in McClintock and McClintock, 1970) in an emotional sermon to his congregational exclaimed:

> *Beauty is the moral atmosphere. The close, unseemly school house in which our infancy was cramped; of how much natural faith did it rob us! In how unlovely a garb did we first see knowledge and virtue! How uninteresting seemed Truth, how unfriendly looked instruction, with what mean associations were the names of God and Wisdom connected in our memory! What a violation of nature's peace seemed Duty! What an intrusion on mind's rights! What rebellion has been nurtured within us by ugly confinements to which artificial life and education how accustomed us! How insensible and cold it has made us to the expressive features of God's works, always around us, always inviting us to high refreshing converse! (p. 18-20).*

No period in the history of American education has spawned grater changes in the nature and functionality of educational facilities. Arguments and debates among architects and educators over whether the spiritual growth of children was enhanced more by Roman, Greek, or Renaissance architectural styles, gave way to the more practical ideas about comfort and efficiency. William Adams (1830), in a speech to the American Institute of Instruction, placed so much emphasis on the importance of efficiency and convenience in school house design, that he advocated macadamizing (paving) school roads. Henry Bernard extended this philosophy in his book on school architecture. This work was entirely dedicated to the functionality, design, equipment, and maintenance of an effective school (McClintock and McClintock, 1970). By 1855 more than 125,000 copies of his remarks on the general principles to be observed in school architecture had been distributed to every town in New York, Massachusetts, Connecti-

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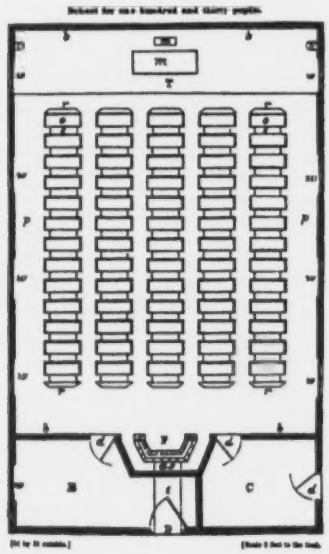

D. — Entrance door.
E. — Entry.
F. — Fireplace, with air tube, or stove.
C. — Wood closet, or recitation room, or girls' room.
T. — Teacher's platform.
b b. — Black boards, &c.
t. — Air tube.
d. — Doors.
m. — Master's table and seat.
p. — Passages.
r. — Recitation seats.
s. — Scholars' desks.
s. — Scholars' seats.
v. v. — Ventilators.
w. — Windows.
a. s. — Air space behind fireplace.

Reproduced from *First Report of the Board of Education of the State of Maine. 1847*
Publ by Wm. T. Johnson, Augusta

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cut, Rhode Island, Vermont, New Hampshire, Ohio, Indiana, and several Provinces of Canada. Also known as the period of the "common schools," these early classrooms often had the teacher seated at a desk located on a central, raised platform designed to accommodate one child after another as they approached to recite from memory or text (Butts and Cremin, 1953). It is important to note that the significance of Bernard's contribution to functionality of educational facilities is substantial considering the pedagogy by which the common schools operated. Efficiency was a positive cultural value in pre-Civil War America; consequently, instructional efficiency was the central pedagogical principle of the day. Bernard realized that much time and effort was wasted due to inadequate schoolhouse design. He contended that with little expense, comfortable desks and seats could be built to replace the old, horrible benches on which small children were forced to sit all day, dangling their legs above the floor. The widespread circulation of Bernard's book insured that persons responsible for building schoolhouses during this period did not ignore the following essentials of good schoolhouse design: Location, size, method of construction, ventilation, heating, furniture (seats and desks), teacher arrangements, instructional materials, the library, yard and external considerations (McClintock and McClintock, 1970).

Bernard was not the first to write on schoolhouse design; however, his was the most thorough work in America on the fundamentals of school architecture. Prior to Bernard's work, several architects had been designing penitentiaries, with the rationale that convicts were positively influenced by design of the structure (McClintock and McClintock, 1970).

Self education was the pedagogy during this period. Persons were expected to receive their education in the "school of life." The formal schooling, one received in a school setting, was only necessary to provide basic skills essential for a real education that was to follow later in life. The sooner a boy could complete his studies in the schoolhouse, the sooner he could get on with the important learning that would follow in life.

THE GRADED SCHOOL

As the Lancastrian schools faded, free graded schools began to appear. These schools took many years to evolve; however, they were the first efforts at dividing buildings into rooms for the separate grades, or else, providing an annex in which students could practice their recitations under the supervision of an assistant master. The separation of grades dictated a different philosophy in the architectural design of the school buildings.

Quincy Grammer School, the first fully graded school in the United States, was built in Boston in 1847 at a cost of $60,210.18. The school, which continues to be used today, has been described as follows:

> *This building formed a new architectural type that was extensively copied in Boston and elsewhere, and this new building with its twelve classrooms, assembly hall, and a principal's office, was thought by many to represent such an advance that little improvement would ever be made on it. For the next fifty years it was the standard type of elementary school building erected in our cities ... this was in large part due to the fact that this building was so well adopted at a drill-and-content type of course of study, which from about 1850 to about 1900 was the dominant one.*

Construction of the Quincy Grammer School did not immediately change the design of all American schools. Many rural areas continued to group pupils in all grades into one room schoolhouses well into the twentieth century. The Quincy School, however, was the prototype for modern schoolhouse design and, with some

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modifications, has been used throughout the twentieth century. The school, since called the "Quincy Box," had four stories, a basement, and an attic. Located on the fourth floor was an assembly hall, that with the use of benches, could accommodate the total enrollment of the school. The other floors were divided into four separate classrooms of equal size. Each classroom was 31 feet by 26 feet (806 square feet) and housed 55 students. The major change in these classrooms was the provision for individual student desks, bolted to the floor in seven rows of eight. This arrangement provided much more comfort to the students than did the boards that served as benches in the typical one-room schoolhouse. The instructional methodology of this time, which required pupils to sit and listen to the teacher, and, on occasion stand beside their desks and recite, was well served by this arrangement.

POST-CIVIL WAR SCHOOL BUILDINGS

The Civil War, like all wars, devastated the nation's educational system. In the southern states, schools and churches were frequently commandeered by the military as barracks and command posts. Being considered public by the enemy, these buildings were ususally destroyed when their usefulness came to and end (Cremin, 1980). In the North, students and teachers alike hurried to join the cause leaving many rural schools virtually abandoned. This humiliating conflict of arms that forced brother against brother and brought immeasurable shame to the Nation, provided the impetus for the renaissance in the functionality of schoolhouse design (Knight, 1969). Throughout history, the machines of war have given rise to advances in manufacturing, materials, and technology. The Civil War was no exception. The Reconstruction Era brought many changes to the complexion of education especially in the southern states.

In the construction of school buildings, wood gave way to brick and stone as the preferred building materials. Controlled heating systems replaced wood stoves and indoor spaces for recreation were provided (CEFPI Guide).

PROGRESSIVISM

The face of elementary education began to change around the turn of the century. With increased acceptance in the U.S. of the learning theories of Heinrich Pestalozzi and John Dewey, negative reactions to the regimented methods of instruction, so prevalent in American public school education, began to occur. The average class size went from over 50 pupils down to the lower 30's, as knowledge increased concerning individual learning and child growth and development (EFL, 1960).

Rugg and Scumaker (1928) reiterated the importance of changes that took place in educational theory around the turn of the century. The inadequacy of the traditional school with its formal regimented instruction was becoming more evident to educators throughout the country. John Dewey (1899), in characterizing turn of the century instructional methodology, referred to the "sitting and listening" school. As the emphasis upon particular needs of growing children continued to expand, the necessity for functionality of design in schoolhouse architecture became apparent. This gradual transition in theory gave rise to a movement that considered school facilities as a place where children could "live as children" rather than as a place where the total objective was on preparation for adult life (Otto, 1944).

An early report by the National Education Association indicated that schools built prior to the turn of the century barely provided shelter for the students and were constructed in such a fashion as to render any program of modern education totally ineffective (Grieder and Rosenstenge, 1954). As rote learning was gradually

One -Room Log Built School in Fox Lake, Alberta

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being replaced by observation and investigation, the need for more accomodating instructional space became evident. Progress in methodology and the introduction of new subject matter required a variety of learning environments.

Dewey proposed a classroom environment that was vastly different from what was common during his day. He accused the traditional classroom of "mechanically missing" the students through its passivity of attitude and uniformity of curriculum and method (Lucas, 1972). Several experimental schools, reflective of progressive philosophy, were established and operated during this time. The Cook County Normal School, established by Colonel Francis W. Parker in 1883, The Horace Mann School in 1887, The Laboratory School of John Dewey, established in 1896, and The Spayer School, established in 1899 at Teacher's College, Columbia University, were examples of these institutions. The experimental schools were early attempts at developing educational programs that necessitated more space per pupil (Cubberley, 1934).

SECONDARY SCHOOLS

The concept of secondary schools had become generally accepted by the first decade of the twentieth century. Given legal impetus by the famous Kalamazoo decision (Stuart v. Stuart District No. 1 of the Village of Kalamazoo, 30 Mich. 69 (1874)), the high school became an extension of the common school program. This action paved the way for all children, regardless of socio-economic background, to earn a high school diploma (Alexander and Alexander, 1985). The requirements for size and variety of space increased as program requirements in secondary schools diversified and broadened (EFL, 1960).

THE TWENTIETH CENTURY

The First World War provided a stimulus for major changes in the construction of educational facilities. The great number of young Americans who were rejected by the armed services gave rise to increased emphasis being placed upon physical education in the public schools. Playing fields, swimming pools, gymnasiums and playgrounds were built all across the country (Erickson, 1985). It was also during the first two decades of the twentieth century that communities began to consider schools partially responsible for the health of the child. As a result, schools began to include new space requirements for health clinics and nurses' offices (EFL, 1960). By 1917, vocational and physical education programs on the secondary level were being supported by the federal government. The curriculum was also including science and commerce in addition to the normal courses for college preparation. As the face of education in America began to change, so did school facilities. More space was required to accommodate the growing curriculum structure as well as the increase in community use of school facilities (Council of Educational Facility Planners International, (CEFPI, 1985)). A significant event in the history of school facility planning occurred in 1921, when the National Council on Schoolhouse Construction was formed in Atlantic City. This organization later became the Council of Educational Facility Planners International, which enjoys much prestige today in the area of school plant planning, architecture, and construction.

THE 1950's TO THE PRESENT

Educational programs expanded during the first half of the twentieth century with new and larger schools being built to house them. Utilization of plastics, glass, and concrete led to the single-story, flat roofed structures of the 1950's. The sixties spawned a boom in schoolhouse construction with the trend being more space for student movement, activity and individualism (CEFPI, 1985). Carpeting, air conditioning, flexible walls, and teaching pods were some innovations emanating from this period. The "open concept" began its short-life span

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during this time, becoming the initial effort in schoolhouse design based, in part, upon research in how students acquire knowledge.

A notable advancement of the period was the move to a systems or modular approach to school planning, design, and construction. The movement began in England following World War II, when new school buildings were needed. Speed and economy of construction were the goals, and prefabrication of components to be assembled into varying designs became the vehicle. This movement reached its peak in the mid-1950's.

Meanwhile, several American states were experimenting with "stock" building plans in an effort to reduce costs. This idea, while practical, was not in harmony with a the prevailing concept of education in the United States: local control of schools. The answer would lie between the single design and construction approach and the "stock" plan approach.

In the early 1960's Stanford University and the Ford Foundation's Educational Facilities Laboratory launched a program to develop stock components designed to fit together simply and easily with minimum alterations on the job site. The project, School Construction Systems Development (SCSD), involved educational facility planners, architects, engineers and manufacturers in developing structural systems, light ceiling systems, HVAC systems and interior paritions. The SCSD system moved school building design and construction into the age of technology.

Another systems program, SEF, was developed in the Toronto Metropolitan School District. SEF made advances in increasing the interchangeability of products from different manufacturers. Other systems arose, notably, the "Project de Recherches in Amenagements Schalaries" of the Montreal Catholic School Commission, the Academic Building Systems projects of the University of California and Indiana State University, and the Schoolhouse System Project of Florida.

1970's AND 1980's

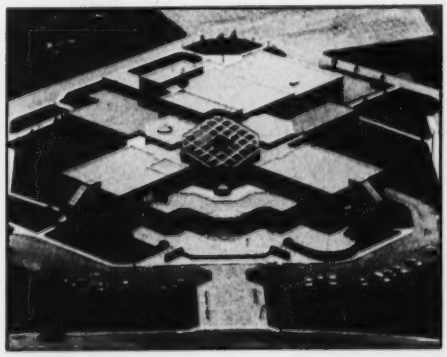
Educational planners in the 1970's coped with a new range of complex issues and needs; changing enrollments and the need for new spaces as well as new uses for old spaces; conservation of energy; career education and space needs; extension of the traditional school to new community uses; barrier-free facilities and accommodations for special students; and modernization in a time of soaring costs. An overridding concern was the continuing move to humanize the educational environment.

1990's AND BEYOND

As the twenty-first century quickly approaches, educational facility planners are faced with new and different challenges. The need for facility planning based upon sound research in the interface between educational facilities and student learning is evident (Hawkins and Overbaugh, 1988). Knowledge about effects of the built environment upon human behavior and learning is increasing and will need to receive extensive consideration by persons responsible for planning instructional spaces of the future.

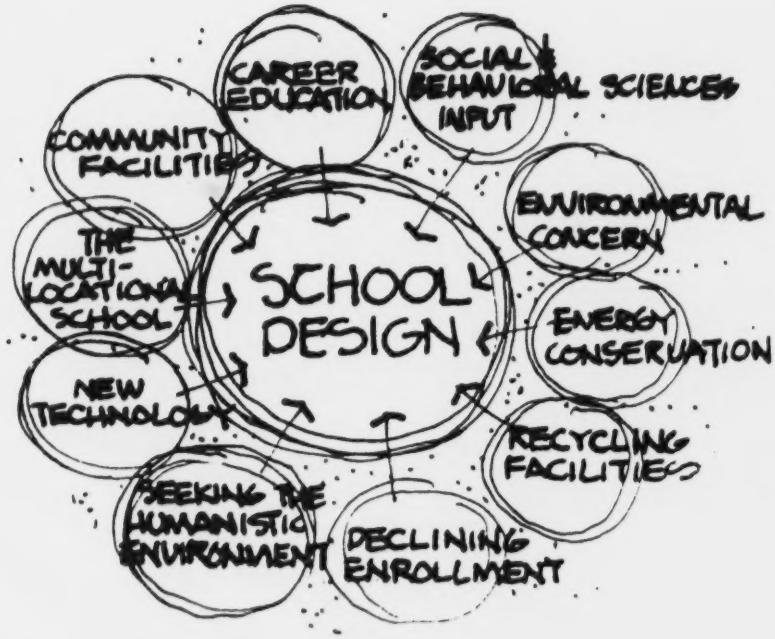
Emerging trends in the utilization of educational technology will change the face of teaching and learning as we advance into the twenty-first century. Indications are, as technological delivery systems increasingly enhance the customization and individualization of educational programs, traditional teacher responsibilities of providing information will evolve into a role of helping students locate, identify, classify, evaluate, and utilize information from a variety of sources (Hathaway, 1989).

Educational facility planning for the future may need to consider not only the accommodation of expanded technological delivery systems for "edu-



Ecole Secondaire Beaumont High
Beaumont, Alberta

Designed by:
McIntosh, Workun & Chernenko Architects, Ltd.



CONTEMPORARY PLANNING ISSUES

cational" purposes, but increase utilization of the schools for non-school activities by community members. As "public buildings," schools of the future may be called upon to serve several functions in society.

GUIDELINES FOR PLANNING

Educational facilities have evolved from the simple concept of the one-room schoolhouse to the well designed environments that are common today. Better technology, new building materials and techniques, new concepts of design and the evolution of theories and practices of teaching and learning have all played a part in this progression. The critical element, however, has and will continue to be people: educators, facility planning specialists, architects, engineers, social scientists, designers, manufacturers and other experts who are continually working for and achieving improvements in planning, design, construction and equipping of educational facilities.

This **GUIDE** is an example of the concern of planners to improve the quality of services to education. First published in 1949, the **GUIDE** has been systematically updated; it constitutes one of the most comprehensive planning tools available today. It is also a tribute to the rich heritage of the Council of Educational Facility Planners, International, and its parent organization, the National Council on Schoolhouse Construction.

This **GUIDE FOR PLANNING EDUCATIONAL FACILITIES** is an authoritative and comprehensive model to be used in the planning of educational buildings from the conception of needs through occupancy and use. Users may be confident that the materials, ideas and suggestions included have met the test of time and can help to insure sound, comprehensive and productive planning and high quality school buildings.

NOTES:

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UNIT B • PLANNING RESOURCES

PLANNING RESOURCES

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PLANNING RESOURCES

The roles and responsibilities of educational facility planners have expanded in response to the increasingly complex planning process. Fortunately, just as the scope of planning effort has broadened considerably, so has the variety of resources available to assist the planner. It is an important lesson from the past ten to fifteen years that effective school planning cannot, and need not, be accomplished in isolation.

The new era of declining resources and significant social change has forced educational facilities planners to acknowledge what should have been known all along — that schools are related to other institutions and are affected by general societal conditions. Furthermore, because each school exists withing a unique milieu, there is no one solution, no definitive facility. Quality is best measured in terms of responsiveness to the needs of the total community, not in terms of an absolute, extrinsic standard. These conditions add a new dimension to the planning process, and those involved in the process need to know of the sources of assistance that are available. It is the purpose of the Unit to describe available planning resources and to suggest how they can be employed.

GENERAL CONSIDERATIONS

The term planning resource is used here to designate those individuals, groups, documents, and other sources that contribute meaningful information and thereby facilitate planning by expanding the knowledge with which decisions are made. The resources will be considered according to functional groupings and level of specific involvement. Placement in a particular category is most often determined by the type of information that can be provided by the source; that is, engineers provide detailed analysis relevant to a technical problem, whereas research foundations provide a theoretical framework relevant to a general state of the art.

As part of the planning exercise, one of the first steps is to identify the information required for the best possible decisions and then to seek the sources of the information. One of the best places to start in the process is to review the large volume of literature available from many professional and academic sources. Following this, further information can be obtained from the sources listed below.

As a result of international information exchanges facilitated by CEFPI, it is apparent that the planning process and the planning resources do not differ greatly from one country to another. While the planning resources are essentially the same, any particular resource may take on more or less importance from one country to another, just as it does from state to state or school district to school district.

For example, some states and provinces exercise great control over size standards for classrooms and other school spaces. Other states and provinces do not have defined standards and, in many cases, do not have final approval authority over plans for educational facilities. Similarly, the top educational agency in some countries exercises maximum control, while in other countries such an agency is nonexistent or serves merely an advisory function.

The type of resources to be used also may vary according to the type of facility to be built. For example, planners involved in the relocation or replacement of an existing school may rely very heavily on in-house or school related resources, as the would-be users are already known. A new school project may require greater input from more general and community-wide resources in order to anticipate the requirements of the new clientele.

The terminology used in this Unit is, to a large extent, based on the United States or Canadian vocabulary. The concepts expressed in the discussion of each resource apply to some degree in all school planning processes, re-

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gardless of country or the particular labels and titles of resources.

PLANNING AGENTS

The board of education, the administrator, and the district staff are the primary school facility planning agents responsible for decision making and implementation of projects. Other first-line planning agents are those consultants and other technical experts employed by the board to carry out specific functions. It is the school board and its officials who decide the extent to which decision making is shared with the community at large and the extent to which the planning resources are allowed to become accessory planning agents.

Policy established by the board of education makes it possible for administrators to organize and carry out an effective planning process. The board can set the stage and establish the climate necessary for viable and creative participatory planning, or it can limit the extent of public involvement and innovative design. The primary decision makers can decide to use input from a variety of planning resources, or they can opt for a more traditional approach, relying upon a small number of technical resources.

The administrator or superintendent, as the full-time principal decision maker in the school system, must be aware of available planning resources and procedures. In many large districts the administrator may not be immediately and continually involved in the facility planning process due to other management obligations. In such circumstances, the facility planning and building responsibilities are usually assumed by a professional educator, planner, or architect on the district staff. So, the board establishes the framework for facility planning, and the chief administrator or designated official provides leadership and implementation of the planning process.

DISTRICT ADMINISTRATIVE RESOURCES

There are several valuable resources within the local district's administrative unit. It is likely that the identification of facility need will have originated internally, and those closest to the decision makers are often best suited to provide a comprehensive and objective overview of the type of facility required. Many of the district staff can provide valuable input at various stages of the planning process.

Educator-planner. The district may have on the staff a professional planner or educator-planner with some responsibility for educational facilities planning. The extent of direct authority and control over the process may vary according to the district's policies, but the persons with planning expertise can provide invaluable services in terms of coordinating and facilitating planning activities.

These individuals should be able to bridge the gaps among all the other participants in the process and should have a working knowledge of educational, physical, geographical, financial, and technical factors involved in facility construction. In addition, the educator-planner may have some expertise in a systems approach to planning and problem solving. These individuals can liaise with all the other planning resources.

Program specialist. Within the school district there are a number of specialists who have valuable knowledge about specific curriculum areas. These individuals can assist in the planning process by providing information on the space requirements and specifications for in-school programs, such as science, physical education, art, and music programs. Such sources can be particularly helpful in translating district or other curriculum standards into the design of physical spaces.

Library specialist. Another area of expertise necessary for the planning

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and design process is that of the district librarian or library services advisory group. Rapid changes in the role and function of school libraries require up-to-date knowledge on the optimal layout of the library and resource center spaces. These individuals can work with the planning and design team to provide a library space flexible enough to handle all the demands being placed on library services, including multimedia and other technological innovations.

Operations and maintenance superintendent. District officials with responsibilities for these key areas relating to building upkeep and operating costs should be included in the planning and design stage for school facilities. In many cases, these individuals are professional engineers and are well versed in the building codes as well as in longer-term, cost-saving considerations. Care in the design of facilities can save thousands of dollars annually in routine costs.

In addition to making recommendations on overall efficiency, these individuals can provide valuable inputs on other emerging design concerns. For example, energy conservation matters and appropriate heating/cooling systems can be developed with the help from these resources. Further, these individuals are knowledgeable in areas related to security and vandalism prevention. Operations and maintenance personnel should be directly involved in most aspects of the facility planning process.

Business administration and financial analysts. The higher costs of new construction, land assembly, consultants, and renovations dictate that the financial aspects of new construction be handled carefully. The district business manager or administrative head, or the individual responsible for financial matters, is involved in the collection and disbursement of funds. This individual helps to ensure that the product of the planning process is financially possible and within the approved budgetary guidelines.

SCHOOL RELATED RESOURCES

Resources available through an existing school approximate the concerns of the potential user group for a new facility. These resources draw upon their first-hand knowledge of the pros and cons of the existing school organization and design. While these resources are not likely to represent the clientele of a new school, they may be the same users who will occupy an expansion, replacement, or relocation of an existing school, or a new school in a similar neighborhood. These resources can provide varying degrees of input according to their direct relationship to the facility under consideration. The groups in this category have a right to comment on aspects of an environment in which they will spend considerable time working, learning, and playing. If the users are ignored by excluding them from the planning process, it is a waste of valuable resources that could have serious consequences. The school could be uncomfortable and inconvenient; worse, the facility could be abused due to hostility or lack of caring; worst, the absence of choice has an alienating effect on the inhabitants.

Principal, head teacher, administrator. All those who have had direct responsibility for managing a school facility have valuable insights to offer to the planning process. The principal has practical knowledge of all aspects of the school operation, including classroom use and organization, specialty areas, public acceptance, working conditions, equipment, internal circulation, and scheduling. School administrators present a management perspective that is useful input to both the general and specific design features.

Instructional staff. The instructional staff use existing facilities on an almost daily basis, and the immediacy of this involvement makes the faculty an excellent planning resource. Instructors can assist in the develop-

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ment of an educational program and its translation into a facility plan. They should have an opportunity to discuss various aspects of the design and education specification with the project coordinators and the architects. To enhance their awareness of design possibilities and to increase their advisory capabilities, it is important that the instructional staff be given an opportunity to learn what is being done elsewhere. As the instructional staff is occupied with the daily challenge of teaching, it is only natural that many will confine their comments to such things as more chalk boards or better parking facilities. By exposing the staff to different trends, practices, and spaces in educational facilities, an open dialogue where ideas flow can be created to make the planning process meaningful.

Support staff. This category includes all persons who contribute to the school services and activities not formally identified with the instructional program. Although it will vary by district and by school, the support staff includes clerical services, plant maintenance and operations, food services, health and safety, and storage. The individuals can provide insight into factors such as student flow, security, equipment selection, and safety. Information from these resources is critical to an efficient design of ancillary spaces vital to the functioning of the school.

Students. Until recently, students have been an underused resource in spite of the fact they constitute the largest user group. They should have an opportunity, in much the same way as the instructional staff, to comment on these aspects of design that lead to a comfortable and stimulating educational environment. Student ideas and needs belong in the planning process; it is, after all, for them that the schools exist.

Students, as full-time users, have insights into the design, furnishings, lighting, and other aspects of school spaces. The students use facilities for a variety of purposes — educational, social, recreational — and can offer clues to the overall school environment. In practice, however, students often lose interest in the planning process because they feel they are being merely tolerated. To capitalize on this resource and all other participant groups, the planners must carefully involve and accommodate those invited to be active in the process.

P.T.A. and consultative committees. In many school systems, each school has its own parents' group, which acts in an advisory capacity to the local school administrators. These groups are often overlooked in the planning process because of their narrow base of support. However, the organized parents' group can offer a perspective on the broad role of the school in the neighborhood as well as that of a particular interest group. As taxpayers and individuals concerned about the effectiveness of the school facility, local parents represent important elements in both the design and community acceptance of the planning process.

The community. Citizen participation has become recognized as a valuable contribution to educational facility planning, especially in the formulation of educational goals and objectives. The planning of community schools should include input from the local community, representing either the existing catchment area or the proposed new catchment area. Local residents are in touch with the community's needs and can assist the planner in translating these concerns into the facility design. The planner should incorporate general space criteria with the specific needs of the community.

In some school districts, community involvement in the planning process is a policy that leads to public knowledge, concern, understanding, and support. In many countries, various school districts have a large proportion of older citizens, and this segment of the population is growing.

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Using representatives and advisory groups from the entire community, not just those with school age children, provides local support for education and ensures that the school operates fully as a community resource.

EDUCATIONAL RESOURCES

There are a number of general resources available to provide a broad perspective on new trends and innovations in the design of educational facilities. As new insights into the educational process are discovered, the application of changes in learning theory and techniques often requires changes in the character of school plans. In some school districts, the advice from these sophisticated educational resources is an integral part of the planning process. The information produced by these sources is available in a number of forms, and the input required can be obtained to fit the scope, timing, and budget of most planning exercises.

Professional associations. This group includes membership organizations that provide a vehicle for information sharing among professionals in areas related both directly and indirectly to facility planning. Groups such as CEFPI, the National Association of Secondary School Principals (NASSP), the Canadian Education Association (CEA), and the American Association of School Administrators (AASA) can be contacted for a number of resource services. Besides publishing journals and newsletters that include items on facilities planning, they sponsor conferences, exhibits, and seminars, produce films and other media aids, and encourage research on a variety of related topics.

Educational Consultants. Educational consultants are those persons who specialize in various aspects of planning from curriculum to finance, and understand how to implement and coordinate an effective planning process. They can provide objectivity and fresh thinking to local school districts as well as expertise on specific concerns. Some consultants operate independently while others are affiliated with consulting firms, universities, and government agencies. They can usually be identified by other school administrators, professional associations, and foundations. Outside consultants can be especially effective in working with the community involvement process. Before a contract between the consultant and school administrative unit is formalized, roles and expectations of both parties should be thoroughly and clearly defined and the potential for an amicable working relationship well established.

Regional, state, and provincial education agencies. Personnel from regional and state or provincial education agencies, especially those persons within the school facilities sections, may serve as consultants to local school districts and participate actively in the planning process. Occasionally such agencies have a regulatory function, and often they must review architectural plans prior to construction to determine that a proposed project conforms to established standards. These agencies often provide financial assistance and require efficiencies and controls in the facility design. Staff from these agencies can condense experiences from a number of districts into practical advice for each new project.

Universities and colleges. Faculties of education and related disciplines at both colleges and universities are useful planning resources. Academic staff and students are often interested in providing assistance to local school districts, both as a practical application of theoretical studies and as a part of continuing research. Some institutions have field service staffs to assist local education agencies. The courses taught in these programs related to educational facility planning can provide useful in-service training to district planning agents, and the local board can use this resource by offering internship positions for graduate students.

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Research agencies and institutions. Valuable information on educational facilities is available through a few specialized research agencies and institutions. These organizations help school districts by supporting studies and by disseminating information in a practical format to help local planning efforts. Some of these resources are affiliated with universities, and some operate independently. These agencies promote research and innovation and often provide the necessary encouragement for local experimentation.

TECHNICAL AND LEGAL RESOURCES

Each educational facility project requires an extensive array of inputs from highly specialized technical consultants. These professional resources are required not only in the preliminary stages of planning, but also throughout the rest of the project period, including detailed design, property acquisition, tender and contract preparation, construction, and operation. As these resources are involved in all types of construction projects, their technical expertise is not restricted to educational projects. However, some may have more experience in school projects than others. The planning team must determine throughout the process when and if certain specialists will be required or if some technical matters can be resolved in other ways.

Architects. The architect's role is detailed in Unit D. In brief, his or her job is to translate the educational program into design concepts that are developed in the building plan and specifications. The architect may function in an advisory capacity during the district-wide survey, site selection and educational planning phases. The architect may be responsible for supervision of construction. In those districts that have a permanent architect on the staff, the role assignment may be very comprehensive. If an outside architect is retained, the selection of such a person should be based on the capability of the architect to undertake all of the duties required.

Even after completion of the project, the architect should work with the planning team on a post-occupancy evaluation program. This is especially important where the school remodeling or construction is a continuing/phased process.

Engineers. There are a number of consulting engineers who are specialists in areas such as land surveys, soils analysis, structural design of building, lighting, plumbing, heating, ventilation, air conditioning, seismic loading, and acoustics. These resources provide technical expertise to the architect and/or the general contractor.

Engineers and contractors can provide assistance in determining the feasibility of renovating existing facilities. For new construction projects, they may suggest alternative materials, equipment, and construction techniques and assist in the preparation of cost estimates. It is mutually advantageous for the engineers to participate in the planning process so that they can contribute their expertise and become familiar with the personnel, problems, issues, and goals relative to the project.

Legal counsel. Many school districts employ full-time legal counsel and others retain the services of counsel. For districts without access to the service, it is necessary to hire such technical expertise during the planning and construction process for a new school facility. It is a fact of modern life that legal counsel is often required for even simple transactions, let alone a complex building project.

It is sometimes desirable and often necessary for legal services to include advice and preparation of necessary documents related to the issuance of bonds or other means required to finance the school project. Financial matters, especially when applied to

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tax-supported school districts, may require careful compliance with all legal procedures. The same may be true for the preparation of documents that accompany a building program. Legal counsel also may be required for property acquisition, contract preparation for design and construction, and definition of liability and other responsibilities.

Assessment and land agencies. Growing school systems with an extensive building program may consider employing a full-time land agent to acquire properties. Such help is especially needed in developed urban areas where many parcels of land are required to put together a site. For those districts that require a new site only periodically, the services provided by these resources can be obtained early in the process to help with the planning and to begin the necessary activities. These individuals provide useful services such as property evaluation and assessment, securing options, legal descriptions, preliminary title searches, and other details of site acquisition vital to a successful building program.

Construction manager, contractor. The construction manager or general contractor works with the school district staff and the architect to bring the project to completion. Many of these resources give the owner a bonded maximum price within the project budget, thereby controlling plans, costs, and scheduling from the outset. The manager or contractor analyzes the design feasibility and develops estimates based upon a working knowledge of construction costs. Suggestions for design change may be made to affect cost and/or time savings. The close working relationships among the owner, architect, and manager/contractor are necessary from the first planning stages to completion of the project, and each party should be aware of the distribution of responsibilities before entering into any agreement.

Equipment and furniture suppliers. The selection of school equipment and furniture is an integral part of the planning process and has broad and long-lasting implications for the users of the facility. Space requirements for certain types of equipment and furniture may affect the internal design of the school. Conversely, the programming needs of the school and their related spaces may affect the choice of furnishings. In either case, the suppliers can act as resource persons for matching needs, spaces, and equipment.

School equipment suppliers and planners are often required on the staff in large systems with extensive building programs. Outside consultants are also available. Assistance also can be obtained from manufacturers' representatives. Although equipment and supplies are required near the completion of a project, the suppliers and planner should be involved during the early planning stages to understand the needs of the proposed educational program.

Other technical specialists. Besides the more obvious technical resources, there are a number of experts in newly emerging specialty areas. These resources may be tapped to resolve particular problems and to advise on unique projects. For example, experts in security services may provide input into an antivandalism program associated with the school design. Or, energy conservation consultants may work with the planning team to help design an energy-efficient and innovative facility. Transportation consultants may be required to assist with design problems related to transit, parking, and traffic. If a particular aspect of the planning process is taxing the planning resources, there are probably experts available to help in the resolution of the problem.

COMMUNITY PLANNING RESOURCES

The local area setting for a specific school project can be provided by

community planning resources. There are a number of public and private agencies that are involved in local planning matters. These resources can provide background information on the general direction of community growth and development, as well as specific information of the socio-economic characteristics of neighborhood or household populations.

This category includes a wide range of possible sources, not all of which may exist in a school district. Generally, one or two of the sources may provide the needed input into the planning process. There will always be some overlap in the information that can be obtained from these organization or agencies. The extent of involvement in the planning exercise by many of these groups will be determined by the scope of the project.

Local planning agencies, commissions, and departments. The local planning commission or any other formal planning agency is an excellent source of data vital to the school planning process. Information can be obtained on land use and zoning, housing projects, demographic and economic shifts, parks and recreation expansions, transportation proposals, annexations, consolidations, and other community changes that may affect the school system or a particular school project. The planning agency can provide both quantitative and qualitative data, and representatives of these organizations should be involved from the earliest stages of a school planning exercise.

Rapid changes in a community can render educational facilities planning obsolete if careful coordination is not achieved with local planning authorities. These resources can recognize those housing projects that are likely to produce school children and those that will accommodate singles or retired persons. Though the school district boundaries may not be the same as the planning commission boundaries, the planning authorities generally have a far-reaching awareness of all aspects of community growth, decline, and change.

Regional planning agencies and commissions. The resources in this category may offer types of information similar to that of the local authorities. However, the planning jurisdiction is usually larger and takes into consideration the longer-term development prospects of a number of areas. The regional boundaries may provide detailed insights into matter such as transit systems, highways, industrial developments, residential subdivisions, parks, hospitals, airports, resource industries, and utility projects. Contact with the regional planning agencies should be maintained to provide a broad contact for the planning of new school facilities.

Civic departments. Important local resources include all the civic departments and protection services. City and county governments offer a variety of expertise through a number of departments. For example, a city engineering department can provide data on water and sewer connections, streets, garbage collection, lighting, and other aspects of the physical infrastructure associated with a school project. Usually a civic department is responsible for issuing permits and building licenses. The department of parks and recreation can be a valuable source of information, especially for data on the composition of the local community and on the inventory of leisure services and facilities.

The standard protection services are often eager to participate in the planning process. Since the well-being of children is an important goal in all neighborhoods, the local health, fire, and police departments all have interests in school projects. Schools are visible and highly respected institutions in most communities, and the protection service departments often use the facilities for local awareness programs. These departments can provide advice on specific design aspects of the schools relevant to their particular concerns.

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Local service agencies. Many communities and school districts have a range of nonprofit and public service agencies that can contribute to the school planning process. Some social service organizations, such as United Way, may have separate research departments to gather valuable socio-economic data on the community. Other service agencies or departments can provide information on matters relating to health, welfare, pensions, workers' compensation, adult education, day care, group homes, and the handicapped.

The sources in this category are knowledgeable about specific interest groups that may become part of the proposed school's clientele. The specific needs of these interest groups may form a necessary part of the facility design. In addition, nonschool programs sponsored by these agencies may form a part of the community service orientation of the school. As the merits of multiple-use buildings are now being realized, the local school district may consider ways of integrating educational services with a full range of other public services. The school may include provision for day care, health services, adult education, and other programs, based on input from the local service agencies.

Residential development resources. A key component in the development of a viable educational facilities plan is knowledge of the potential students and other user groups. This information can be obtained directly from a number of resources involved in the residential development industry. Included in this group are builders, developers, financial institutions, real estate associations, cooperative housing societies, and tenants' groups. These resources contribute to the overall understanding of the existing or proposed catchment area.

Contact with these resources may be established early in the planning process when the size and time table for a new facility are being discussed. Follow-up data as required may include family size and composition, housing types, density levels, market costs, rental rates, proportion of assisted or social housing, development schedules, and take-up rates. These resources generally will provide as much information as needed to the planning process because of the important role schools play in the quality and viability of a residential area.

Planning and development consultants. Another local resource that may be used to good advantage is the planning and/or development consultant. These individuals may be able to provide guidance on the use of a successful planning process and on the best means of obtaining necessary municipal permits or approvals. Further, these resources can be hired to provide the planning team with the desired community inventory data. Consultants also may have expertise on the development of planning programs that can bring the project to completion on schedule. In many cases, the extra costs for these specialists result in savings in the long run.

Other local resources. There are a number of potential sources that may contribute assistance on a variety of local concerns. For example, there are traffic and transportation specialists available to provide details on site access problems. In some older urban areas there are heritage advisory groups able to discuss the possible implications of any changes to designated heritage schools. The media, local church groups, business associations, and local public utility companies can all be approached for information of specific details about the local community.

GENERAL RESOURCES

At the most general level, there are agencies, departments, commissions, foundations, and other organizations of national or international prominence that can supply directional, jurisdictional or financial support to the educational facilities planning process.

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While some resources exert control over the local effort, most are limited to theoretical advice and support. Many institutions at this level present state-of-the-art concepts that may be applicable to any given school planning project. Not all the resources available in this group will be useful for a routine school project, but there are some international projects and new district programs that can benefit directly from this type of expertise.

Federal government agencies and departments. In some countries, educational responsibilities fall under federal jurisdiction, while in others the federal government plays only a minor or indirect role. CEFPI maintains information on the appropriate agencies in most countries.

Often, the responsible federal agency or department provides a transfer payment to support local educational activities. When education is controlled at the national level, then any local planning efforts must use the basic facilities guidelines as directed by the federal agency. When the control over educational services is at the state or regional level, federal input may be very limited.

In both the United States and Canada, the primary responsibility for education is at the state or provincial level. Federal programs for planning and constructing school facilities are now extremely limited and it appears that none are forthcoming. Federal sources do not provide direct financial or personnel assistance to local education agencies. Some agencies administer programs with direct implications for facility planning, such as the U.S. Department of Education and the Secretary of State of Canada. Other federal departments may have indirect implications for school buildings. In Canada, for example, most local building standards must be equal to, or greater than, those contained in the federal governments's National Building Code.

State and provincial departments. In addition to the state and provincial departments with direct responsibility for education, there are usually other agencies or departments at this level with some effect on local school facilities planning. These groups may perform functions similar to those of the local planning commission, except they serve a larger geographical area. For example, certain departments may have jurisdictional control over any construction on flood plains, agricultural land, coastal or forest lands, or park reserves. They are often involved in the development of long-range goals that may have implications for local school projects. Because school planning cannot be disassociated from planning considerations related to other interests and spaces, it is both expedient and beneficial to establish communications with such planning agencies. Although contact and information exchange with these groups are appropriate to the planning process, do not expect these agencies to make decisions for the local project.

State or provincial commissioners responsible for services such as fire prevention, water supply, and utility controls also may participate in the planning process. These agencies may review proposed building plans and disseminate guidelines specifying mandatory requirements. In districts without local agencies to perform these functions, state or provincial representatives may be involved to implement zoning regulations, building restrictions, fire and safety regulations, and other controls. The project architect should be aware of the appropriate levels of approvals.

National and international professional associations. This group includes membership organizations (such as CEFPI) that offer a worldwide perspective on matters relating to education and school facilities. As indicated earlier in the discussion of education resources, many professional

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associations actively promote information exchanges and encourage research that has implications for facilities planning. Some of these associations provide technical expertise on matters relating to all types of construction and includes such groups, in the United States, as the National Board of Fire Underwriters and the Illuminating Engineering Society. These organizations generally maintain information on their counterparts in other parts of the world.

International agencies. Although the work of these resources is primarily directed to developing countries, there may be some transferable data applicable to school projects in industrialized countries. Organizations such as UNESCO and the World Bank have been responsible for upgrading facilities and improving the quality of construction in educational systems throughout the developing world. By providing funding, trained personnel, support materials, and commitment, these organizations have become adept at planning and implementing a variety of educational facilities projects. Some of this expertise may be tapped through a variety of media sources available from these agencies.

This Unit is not an exhaustive catalogue of planning resources. Rather, it points out the types of resources that may be used during the entire project period. The Unit does, however, provide an overview of various sources of assistance and guidance available to those involved in the planning process. The services can help to: (a) ascertain that the planned facility is what, where, and how much a community needs, (b) learn about current design, educational and technological innovations, (c) assure that the buildings to be constructed conform to legislated standards, and (d) determine the financial and practical feasibility of the project. Ways to use many of these resources will be discussed in later Units.

It is probably safe to say the quality of a planned facility is more dependent on how these resources benefit each project, rather than on how many or which resources are used. The planning team must be discriminate in choosing from the wide range of possible sources. Each resource must be evaluated in terms of its potential costs and benefits and then used intelligently and sensitively by the cooperating planners. In most cases, the planning process is limited by time, personnel and financial constraints, and the available resources must be used wisely to provide the maximum amount of input necessary to make the best possible planning decisions.

DEVELOPING A MASTER PLAN

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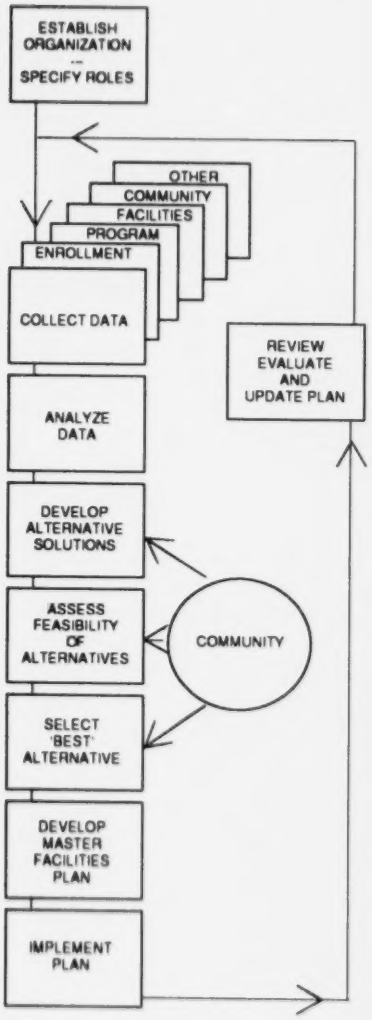

MASTER PLANNING PROCESS

Development and use of a facilities master plan is the key to providing and managing high quality educational space whether it involves building, buying, renovating, closing, leasing or selling. This plan is developed through the integrated efforts of people with a variety of skills such as educational facility planners, architects, educators, community members and engineers. Others may be involved as particular problems emerge and are dealt with.

Responsibility for development of a facilities master plan resides primarily with the educational facility planner. This individual is often an educational administrator with special technical skills that provide for an understanding of the complexities of contemporary educational facilities and enable communication with, and coordination of, a variety of specially trained professionals. It is the educational facility planner who provides for continuity on a project from the planning stage to the design stage, through the occupancy stage, and on into the evaluation and feedback stage, which can often initiate a new or revised facilities master plan. This unit describes how the facilities master plan is developed. The process can be broken down into nine steps:

1. Establish an organization and specify the roles and responsibilities.

2. Collect data about such factors as enrollments, facilities, community expectations and the educational program.

3. Analyze the collected data and identify trends, directions and goals.

4. Develop alternative ways of achieving the ends identified by analysis of collected data.*

5. Assess the feasibility of each identified alternative.*

6. Select the preferred or "best" alternative(s).*

7. Develop a facilities master plan to achieve the chosen alternative(s).

8. Implement the plan, provide the required facilities, and put the developed facilities into use.

9. Evaluate the completed facilities and initiate an update of the facilities master plan.

* Involving the community in this step may gain greater acceptance for the selected alternative.

The following questions may be asked to elicit information that will aid in the development of the facilities master plan.

- What are the trends that will influence educational facilities in the future (e.g., computers)? How will the impacts be felt?

- How do the board's facility policies and procedures relate to current needs?

- What do enrollment projections predict as enrollment levels for the attendance area(s) under review?

- What are the current levels of investment in facilities? What is the condition of these investments?

- How will emerging management information systems influence development and implementation of a facilities master plan?

- How can an energy conservation plan be incorporated into a facilities master plan?

- Is it possible to systematically review facility requirements so that the least needed space is disposed of and unused space is kept to a minimum?

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- How can the community be involved in the facility planning process?
- How can information be communicated to boards to assist them in facility management decisions?

Answers to these and other questions will yield detailed data that must be categorized and stored for analysis. The availability of relatively inexpensive stand-alone computer hardware means that even the smallest districts can afford some form of information management.

Following the proposed steps and asking the necessary questions should aid the educational facility planner in developing a facilities master plan with these features:

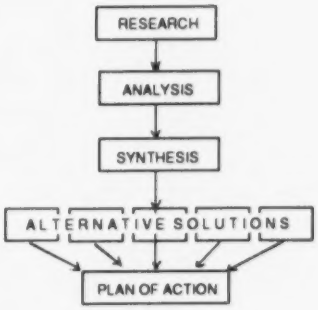
- Analysis of the community's or campus's characteristics and particular educational needs.
- Determination of student population and characteristics.
- Description of the educational program.
- Appraisal of the educational and structural adequacy of facilities.
- Assessment of financial resources.
- Formulation of specific recommendations.

THE COMMUNITY ANALYSIS

An integral part of educational planning is an analysis of the community or campus, including a documentation of its history, an assessment of its present status, and a projection of its future character. In preparing the community analysis, an effort should be made to determine what citizens expect from the school (its reputation) and what their educational needs are. At the college or university level the same applies; the "community" must be identified and a clear statement of the role of the institution developed.

A survey of a community's history provides a background against which present conditions acquire meaning. The following are examples of community characteristics that may require examination.

- Population characteristics and density patterns.
- Population changes due to in- and out-migration patterns and to fluctuations in the birth rate.
- Changes in land usage (residential, commercial and industrial).
- Major highway and street networks and their probable future development.
- Changes in socioeconomic patterns and needs resulting from population shifts within the community and other community changes.
- Geographical limitations.
- Condition and value of housing in residential areas and of commercial buildings in industrial areas. Alternative uses of areas should be considered in all planning stages.
- Availability of community services—libraries, recreational areas, health services, public assembly space, etc.
- Vocational opportunities in the community.
- Parental expectations of the schools.
- Citizen attitudes and aspirations in general.
- Possible shifts in housing patterns due to attitudes about racial integration.
- Changes in school district boundaries.
- Identity of the clients. What are their potential needs?



COMPREHENSIVE EDUCATIONAL SURVEY

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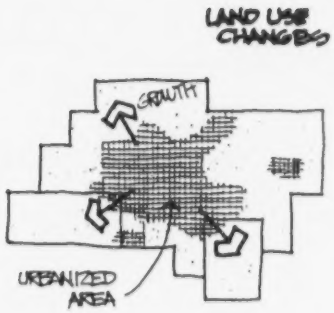

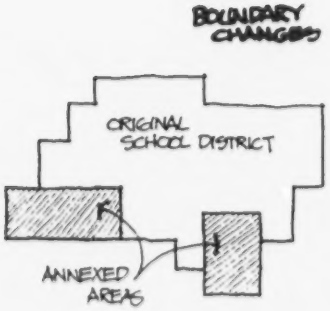

Communities are so complex and their suborganizations so interdependent that a major decision made in one segment may affect others. For example, the conversion of residential land to industrial use may isolate school buildings or otherwise place them in an undesirable educational environment. Freeway systems occasionally slash through school administrative units causing unsatisfactory attendance boundary changes and producing problems for the school transportation system. The rapid movement of population into or out of the district or neighborhood can bring about a crisis situation. Declining population and a corresponding drop in school enrollment can result in underused and unneeded school buildings.

For these reasons, as well as many not identified, no facilities master plan is complete without an overview of the total community. Much of the needed data can be obtained from school records and from other public agencies and institutions. While some information may require computer analysis, other information, especially that related to attitudes, can be collected by a survey implemented by community groups.

SCHOOL ENROLLMENT STUDY

Developing data on school enrollment is a topic that deserves special consideration because of its technical complexity and because enrollment figures are concerned with a particular population segment.

In general, the following statistics are useful components of the plan: population trends of the total school community, birth rates and the number of births, public school enrollment figures, non-public school enrollment figures, holding power of public schools, and housing patterns.

The school census is an important record that can be used in assessing educational facility needs. A continuous, complete census system is invaluable in providing insights into many factors affecting future public school enrollments. A word of caution: school census data have in some cases been notoriously inaccurate mainly due to the slipshod methods of data collection. A poor census, like other data, is worse than none at all.

Historically, long-range projections have been unreliable. In the 1930's enrollment increases that were to occur during the 1950's were not foreseen. Likewise, the declining birth rate (resulting from the appeal of the birth control pill and "zero population growth") that affected enrollments in the 1970's was not predicted. Trends now seem to be pointing to an echo of the post-war baby boom. Enrollments may climb during the 1990's. It is therefore imperative that school administrators annually update population and enrollment projections so that changing conditions can be identified and their effects anticipated. Even under the best of circumstances it is difficult to anticipate changes. Newer, more sophisticated technology may make the task easier.

Before studying various methods of enrollment projection, some factors that affect the projections should be discussed. The method used to project enrollment should be determined by the particular set of circumstances of the district involved in order to obtain the highest possible level of accuracy.

Changing economic conditions. Population growth or decline in a given community is often related to changing economic conditions. Such factors as urban renewal or new housing developments affect migration into, out of, or within school administrative units. Analyses of these factors may require the help of specialists, such as city or regional planners, and should be current to insure the validity of estimates and their effect on enrollment projections.

High costs, escalating interest rates and the energy crisis are a few ele-

ments that have reduced mobility and have affected enrollments in city and suburban schools. Suburban school district pupil populations had been increasing at tremendous rates during the 1960's, whereas inner city districts had been decreasing at even greater rates. By the 1980's both had experienced almost stabilized enrollments, and in some cases the growth trend actually reversed.

Non-resident and non-public school students. Public school enrollments in many districts have often been dramatically affected by the transfer of non-resident pupils from nearby districts. Policies concerning acceptance of non-resident pupils can substantially affect enrollment forecasts. Similarly, any significant change in the percentage of the total number of children in the district who attend non-public schools will have an impact on future planning.

Boundary changes. School district boundary changes, resulting from court orders, district reorganization, annexation, or consolidation of territory affect enrollment projections. Likewise, the growth of city school districts that depend on annexation is often thwarted by suburban areas that have become incorporated cities or towns with separate school systems.

Pupil dropout/retention/acceleration. Patterns of pupil dropout/retention/accreditation may be analyzed in estimating future pupil load. In theory, total school enrollments should be increased by retentions and decreased by accelerations and dropouts. However, retentions often stimulate pupil dropout and ultimately tend to decrease total enrollment. Changing promotion policies alter projections based exclusively on analyses of past practices. This is, of course, true of any policy change.

Land-use changes. Changing land-use patterns influence enrollment projections for all types of school districts. This is most obvious when farm land is converted into lots for home development, or, to the contrary, when existing housing is leveled for new highways or renewal projects.

Type of housing. The cost and type of residential dwellings will often affect school enrollment as much as, or more than, the number of houses constructed in a given area. Studies have demonstrated a close relationship between school enrollments and the number of bedrooms in each family unit. Although two-bedroom homes often produce a high preschool density, the movement in and out of such homes due to increasing affluence and growing family size seldom produces in-school densities as high as the preschool densities suggest.

Projecting future enrollments. Several methods, none of which are highly accurate, have been devised for projecting school enrollments directly from basic date, i.e., birth rates, migration patterns, mobility within administrative units, and other factors previously discussed. Other methods are based on an estimate of the total population from which school enrollments are deduced. Some common approaches to enrollment forecasting are described below:

1. One projection technique emphasizes an *analysis of census data.* Past census data are examined to ascertain either the rate of change or the average increment of change over a given period of study. The major criticism of this approach is that it ignores the possibility that one or more of the factors that produced changes in the past may no longer be operative.

2. Another typical approach to estimating future enrollments is based on *analogy.* It is assumed that if two districts are similar, then what happened in one will occur in the other. The flaw is the difficulty in identifying comparable communities.

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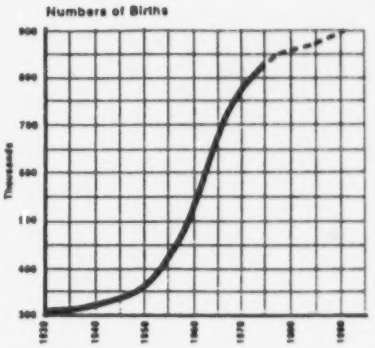

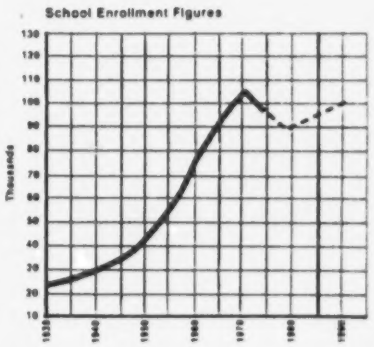

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3. *Relating school enrollment to total population* is another way to form estimates. Total population projections are often more difficult to compute than those for school enrollments alone. The procedure, therefore, is used primarily when total population projections are available from other sources. The actual ratio used in such projections is sometimes determined by analysis of the existing or past census data or by analogy with other districts. This method can be valuable for long-term projections, but it is seldom sufficiently reliable for short-term projections. Of course, its accuracy is directly related to the accuracy of the basic total population projection.

4. *The average survival ratio technique* is probably used most often to project enrollments. It uses historical data, but it modifies this data in light of new trends. This procedure tends to lump together most factors affecting future enrollments except birth rates, which are treated independently. It is best used for short-term projections. It is unreliable for rapidly growing districts unless it is used as a starting point for multiple-factor analysis. The average survival ratio method compares birth data for a given year with public school enrollments in kindergarten or grade one some five or six years later. It then compares numbers of pupils in one grade with those in the next higher grade one year later. With birth data already available for groups who will enter the public schools for the next five or six years, first grade enrollments are projected by applying the average ratio obtained from the historical analysis. The average survival ratio should be adjusted to take into account specific trends easily identified by individual analysis. For example, in rapidly growing communities, the effect of in-migration can be more accurately projected as an additive factor based upon projected new home construction.

5. *Saturation analysis* projects the school enrollment that might result if all the land in the district was completely developed. These studies are particularly important in determining long-range plans in urban areas where site requirements must be established before building to insure adequate sites without the expense of purchasing developed land. Because the saturation study requires knowledge of land-use patterns, the involvement of city planning experts is particularly important. Basically, the procedure is to ascertain the number of acres likely to be used for residential purposes. It is important to consider land allocated for parks, roads, schools, and other community facilities. The probable residential areas must then be translated into probable dwelling units at the time of total development, taking into account existing and probable zoning regulations. The nature of the land may result in development that far exceeds minimum zoning regulations. The probable number of dwelling units is then multiplied by an estimated ratio of pupils per dwelling unit to determine the probable school enrollment at the time of saturation. Pupil density ratios (pupils per dwelling unit) vary considerably from one district to another as well as within districts.

The factors mentioned in connection with other enrollment projections are also considered in the analysis and determination of probable future density ratios. Aging of communities is another influencing factor. District-wide density cannot be used for saturation studies because housing developments vary in pupil density ratios.

It should be clear that projections depend in whole or in part upon past conditions. They thus rely on the

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continuation of past trends for accuracy. All projections are a form of probability statement.

When pupil populations are projected, it is usually wise to bracket enrollments rather than to give one estimate. The *dual projection procedure* brackets the target figure by using one set of assumptions that may result in low estimates and another set that may result in high estimates. These two sets of assumptions are usually more defensible than a single set because conflicting trends affecting future enrollments may cancel each other. Since long-range plans call for enough flexibility to satisfy the realization of either high or low enrollment estimates, the dual projection procedure serves a useful purpose.

The assumptions selected should not result in absurdly high or low projections. It also should be emphasized that the dual projection procedure does not eliminate the need for detailed analysis of factors that affect future school enrollments that are not part of the assumptions. The approach should not be used to make two "best" projections of probable enrollments, but rather to bracket the target with an estimate that may exceed actual future enrollments and another that may be lower. Unless the bracketing concept is understood clearly, dual or multiple projections only confuse the issue and make planning more difficult.

THE EDUCATIONAL PLAN

The educational plan is that section of the facilities plan that describes the community's educational philosophy. It also defines the purpose of the school or institution and the policies and practices surrounding the program implementation.

Educational philosophy. All aspects of educational philosophy, purpose and policy should be discussed by community, staff and student representatives as well as by professional planners, consultants, and others whose special knowledge can be helpful. The theoretical elements of the educational plan should deal with concepts such as how learning happens, what the teacher's role is in promoting learning, which activities should be student-initiated, what should be studied, what skills should be developed, what aspects of character are valued, and which environments are best. The relationship of the community to the school also should be considered. There is a broad range of issues that should be explored and that will affect the specific program(s) developed.

The planners should attempt to define the quality of the educational experience the community will provide for its children, the career and life preparation it considers valuable, and the adult education and community-related programs it wishes to support. The educational plan is concerned with the character and scope of the formal and informal institutionalized learning process. It should outline the practices that will provide desired educational opportunities most completely and efficiently.

The educational plan provides a standard against which existing facilities can be measured, i.e., how well the facilities support the goals defined in the plan. Are the facilities designed for the activities they will house? To what extent have the activities and the participants changed in recent years? It also is a source of invaluable information for the planners and designers of new facilities.

Besides a statement of the educational goals, services and style that the community endorses, the educational plan can include a discussion of the following subplans. The development of each subplan will require input by specialists in the various areas.

1. *The instructional plan* is an outgrowth of the community's general educational philosophy. It discusses what subjects will be included in the curriculum and how course material will be offered on all levels.

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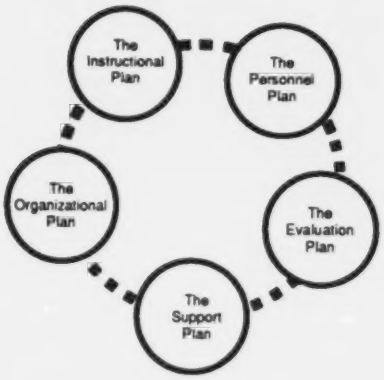


THE EDUCATIONAL PLAN

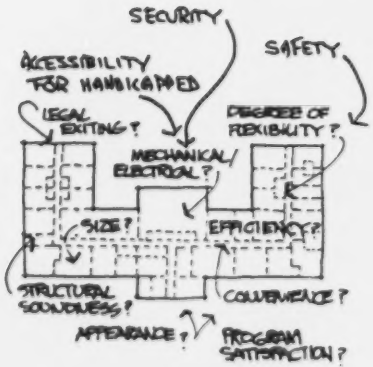
2. *The organizational plan* is a system to promote and support the instructional plan. It concentrates on such matters as graded or ungraded organization, team teaching or one-teacher-per-unit formats, maximum/minimum/optimum numbers of pupils per teacher, and organization of subject matter.

3. *The personnel plan* describes the staff required to implement the instructional program. The criteria for selection of teachers and administrators should be outlined as well as guidelines for staff orientation, assignment, retention and dismissal.

4. *The evaluation plan* describes the means of assessing the performance of the school in fulfilling its goals. It should outline what instruments and criteria are to be used in the evaluation process.

5. *The support plan* outlines the resources and services needed by and available to the instructional plan. For example, it details provisions for career guidance, psychological counseling, food services, health programs, transportation, and maintenance.

Because the educational plan is broad in scope, formulating it is a complex undertaking, but one that is central to the total planning process. The success of subsequent planning depends on how accurately and thoroughly the plan articulated the community's educational philosophy and the way educational goals will be realized.



FACILITY EVALUATION

EVALUATION OF EXISTING FACILITIES

A facilities master plan must include an examination of existing facilities. The appraisal should concentrate on answering these general questions: (1) In and of itself, is the building adequate? and (2) Does the building effectively accommodate the users and the program?

Specifically, the appraisers should examine the following conditions:

1. Is the facility structurally sound?
2. Is it healthful and safe?
3. Is it efficient to operate?
4. Does it support the program?
5. Is it attractive and comfortable?
6. Is its location convenient for the users?
7. Is its space optimally used?
8. Is it the right size?
9. Can it be modified?
10. To what extent can required activities be accommodated?

Responding to these questions requires knowledge of a broad range of concerns from the technical to the aesthetic. The evaluation should concentrate on spaces for teaching/learning, administration, and support services.

Physical appraisal. Health and safety standards are outlined by local, state and federal building codes; compliance with these codes is ordinarily carefully regulated. Nevertheless, the appraisers should not ignore health and safety aspects of the built environment. Accessibility for the handicapped also should be considered. These are all essential to the operation of a desirable educational program.

The structural soundness of the building should be evaluated in terms of the condition of the foundation, stairs, stairwells, floors, walls, ceiling and roof. Structural adequacy, if questionable, should be checked by a qualified engineer. Generally, schools tend to become educationally obsolete before they become structurally unsound.

Other major physical factors to be evaluated concern the condition and operation of heating, ventilation and air-conditioning (HVAC) systems, and electrical, lighting, water, and sewage systems. Needed repairs and replacements should be noted. Finally, but no less important, the operation and maintenance costs (especially energy costs) should be reviewed. Attention should be paid to the facility's effi-

cient use of energy and whether high energy consumption is due to human wastefulness in operating the plant or to poorly designed structural and environmental systems.

The aesthetic quality of the school building and site should be considered. The school should be visually attractive and well landscaped. In addition it should be comfortable and capable of encouraging full and constructive human use.

Occasionally school buildings have historic value—they may be old or original community structures representative of a unique style. Preservation of such buildings should be considered in the evaluation process.

It is recommended that an architect and an engineer be employed to make the physical appraisal of the school building because of the technical aspects of the appraisal and the potential exposure to legal liability.

Program support appraisal. Perhaps the most crucial aspect of the facilities evaluation is concerned with how well the building supports—or can be economically modified to serve—the educational program. Older buildings should be examined for their adaptability to accommodate teaching/learning situations, techniques, and equipment they were not initially designed to house. Building spaces that were not designed for instructional activity (halls, storage areas, basements) also should be evaluated for potential renovation.

Site appraisal. The location of an educational facility should be evaluated in terms of convenience, safety, proximity to students, and the quality of the neighborhood environment. Detailed spot maps showing where concentrations of students live in relation to the school are helpful. The site also should be appraised in terms of its suitability for the educational program.

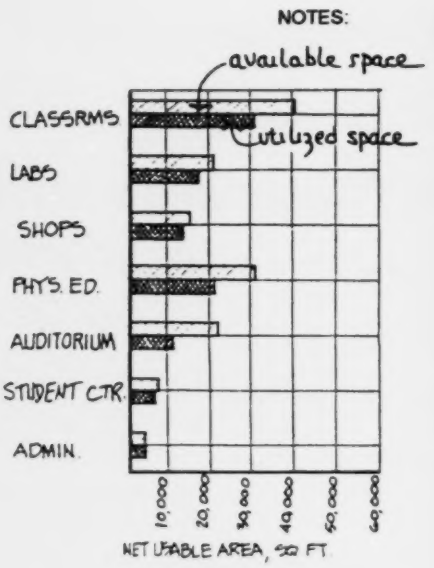
Utilization. Utilization of existing facilities primarily involves two issues: (1) Are optimum numbers of people inhabiting a given space? and (2) is optimum use being made of the space? Determining how well an existing facility is being utilized appears to be a simple process: take the capacity assigned a building and the number of people using it, and figure the percentage of the capacity being used. Determining capacity may be as simple as looking up the capacity assigned to the building by the state education agency when the building plans were approved (although changes over time may have rendered this figure obsolete). Occasionally state education agencies have formulae for computing capacity.

The utilization of the educational plant may be expressed in terms of room utilization or student station utilization. Room utilization is usually expressed as the percentage relationship between the number of periods per day that rooms are used and the total number of periods all rooms are available for use. Similarly, student station utilization is expressed as a percentage relationship between the number of student stations used and the total number of student stations available for use.

Utilization should not be judged solely in terms of the number of pupils per square feet of area or the frequency of room use. The overall educational program, department programs, and specific courses should be examined to determine *what* is being done in the school and, perhaps more important, *how* it is being done.

It also should be noted that capacity may be reduced as the quality or scope of the educational program is improved.

School size. The size of an educational facility should comfortably accommodate the inhabitants and support the educational program. Other local factors such as density of population, availability of sites, and transportation capabilities have bearing on



UTILIZATION DIAGRAM

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school size. There is little reliable research on ideal school size. A thorough search into the literature would probably yield almost any number between 100 and 6,000 as having been proposed by someone as the minimum, maximum or ideal student body size. At one time there was fairly general acceptance of the idea that there is a positive relationship between bigness and educational quality. However, it has been observed that there is no virtue in size alone. In cities, large schools are common, mostly because of economy and high land costs. In such cases, the negative effects of size on the quality of human relationships must be dealt with.

Evaluation instruments. Many tools have been developed for the evaluation or rating of school buildings. An examination of some of these (Sumption and Landes, 1957; Reida, 1962; New Jersey State Dept. of Education, 1976; Keck, 1978; and "War on Costs, " 1982) reveals more similarities than differences. They often vary in the order in which major areas for evaluation are arranged, the approach or emphasis used, whether a point system is additive or subtractive, or whether a numerical scorekeeping procedure is used at all. Such instruments can be valuable as tools for data collection or as check lists in the total evaluation process, but their limitations should be recognized and the results should be interpreted by experienced and well-trained persons.

IF ONE ACCEPTS THE PREMISE THAT A SCHOOL PERFORMS A SERVICE FUNCTION FOR THE EDUCATIONAL PROGRAM, THEN THE ADEQUACY OF THE PLANT SHOULD BE JUDGED IN TERMS OF THE QUALITY OF SERVICE IT WILL RENDER OVER ITS USEFUL LIFE SPAN. THIS SUGGESTS THAT BOTH TECHNICAL AND EDUCATIONAL FACILITIES MUST BE CONSIDERED.

Carroll W. McGuffey
MEEB: MODEL FOR THE EVALUATION OF EDUCATIONAL BUILDINGS
Chicago: Simu-School, 1974

MEEB, an evaluation instrument developed by McGuffey in 1974 (published by Project Simu-School), takes a systems approach. The use of this instrument requires the involvement of a professional planner who can assist in the development of evaluation criteria.

DEVELOPING THE FACILITIES MASTER PLAN

The facilities master plan is an illustrated document that describes existing and future buildings, site topography, building orientation, climate, vehicular and pedestrian circulation, location of utilities, energy resources and consumption, site development, financial capability, and neighboring land use (both current and projected).

Master planning is a way of identifying the best route to the future through a workable plan for handling priority-rated, predictable situations and anticipated changes. A master plan defines ultimate goals and the facilities required to help achieve the goals. The capacities and capabilities thus defined are realized, if necessary, through several phases of construction and expansion or reduction and modification. These activities are viewed in terms of their relationship to the total program.

Assessment of energy resources. The development of the facilities master plan cannot be completed until energy has been considered. The level of energy use, an energy utilization index and an energy budget are important features of the plan. Steps also should be taken to examine the continuing availability of energy resources that will be required to operate the building indefinitely.

Assessment of financial resources. If the facilities master plan reveals a need for facility improvements or new construction, cost estimates are made. For most school districts, the amount of money that can be spent on construction or modification is determined by legal considerations, by the real or supposed willingness of citizens to provide funds, by the availability of state or provincial monies, or by a combination of methods. Therefore, the fiscal affairs of the school administrative unit must be thoroughly analyzed. When all alternative methods of financing are evaluated and careful long-range financial planning is accomplished, savings of large sums of money often result.

Several funding sources for educational facilities are listed below. More detailed discussions appear in Units K and L.

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Funding sources. Historically, local funds have been the primary revenue source for school construction. These funds are ordinarily derived from local property tax levies, although gifts, bequests, insurance settlements, and sales of school district property are minor local sources that may be available.

Local property tax receipts might be earmarked for construction of school facilities on a cash basis, but this financing method is usually not feasible unless the tax base is exceptionally large and/or the needed improvements are relatively inexpensive.

Some states permit local school districts to levy taxes for accumulation of funds for future school building needs. Funds are collected, invested in interest-bearing securities, and accumulated until sufficient amounts have accrued.

Local school districts have the capacity to issue bonds for school building purposes. Often statutory or constitutional requirements limit the amount of bonds that may be issued, the interest rate that may be paid, or the length of term of the issue.

Some states permit lease-rental or lease-purchase arrangements for school facilities with public or private financing authorities. This type of financing is usually allowed when legal debt limitations are unrealistic; it often costs more in interest payments than do direct debts of the school district.

In recent years many states have expanded their participation in financing school facilities. This participation has taken many forms, including grants of funds for construction or for debt service, loans from revolving funds, combination loan-grants, state purchase of local school bonds, and creation of state authorities for lease-rental or lease-purchase arrangements.

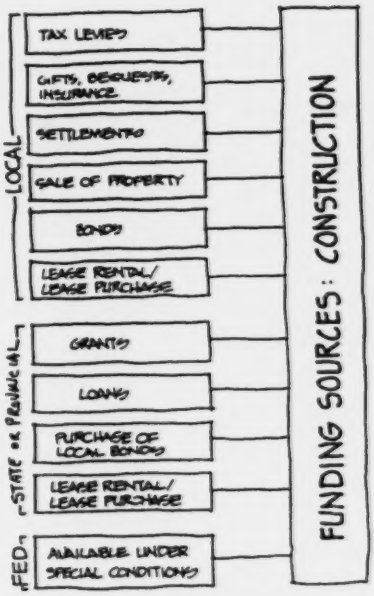
Federal funds for construction purposes have been negligible except for those districts burdened by erosion of the local tax base or by enrollment increases from federal installations in or near the school district. Federal monies are available for equipment under certain conditions.

Estimating construction costs. Accurate long-range forecasts of construction costs are difficult to develop. Price trends of materials and labor are almost impossible to predict accurately. Therefore, specific long-range estimates are best avoided unless demanded by school officials. When cost estimates are given for a five to ten year period, school officials should be aware of the questionable validity of the estimates and should attempt to have them updated periodically.

Analyzing capability for funding construction. All potential funding sources—and combinations thereof—should be considered. If construction funds come largely from property taxes, historical trends of assessed valuation should be studied and a projection for the future should be developed that will be updated annually. Outstanding school district debts should be analyzed for the possibility of dovetailing payments with potential future debt-service requirements to obtain equal annual payments and possibly stable tax rates. Projected expenditures for staff, operation and transportation should not be ignored.

Cooperation with municipalities and county governments in financing planning is often overlooked. Possibilities exist for joint school-civic government action with respect to site acquisition, use of certain facilities, and urban renewal programs on both new projects and major alterations. Some states, however, have laws restricting full joint use of facilities.

The history of the community's willingness to support public education should be studied. Barriers and non-supportive groups should be identified and analyzed. Public involvement in planning and public relations



FUNDING SOURCES: CONSTRUCTION

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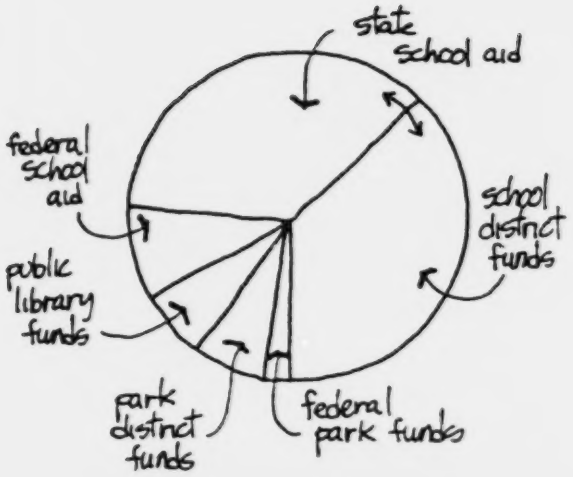
programs should be instituted. Comprehensive facilities surveys that have involved citizens have proved successful in gaining public support for school construction projects.

Recommendations. The recommendations section of the facilities master plan should document the need for additional sites, abandonment of existing facilities, new construction, modernization, renovation or change in use.

Recommendations should address both short-and-long range needs and situations. Recommendations that address immediate needs also should facilitate the attainment of long-range objectives. The development of recommendations involves reviewing pertinent facts, considerations, and alternative solutions, and using good judgement in making final decisions.

Reconciliation between educational facility needs and financial resources usually is made in the recommendations development stage. Occasionally elements of the plan must be postponed until funds are available. However, a general plan for financing the improvements of each phase should be developed and a specific financing plan prepared for immediate projects.



CONSTRUCTION FUNDING

INTERPRETATION OF THE PLAN

The Board of Education, which was responsible for seeking the facilities master plan, will present it to the community and act upon its recommendations. Since implementation of any major building program is usually contingent upon public understanding and support, the community must be fully informed of the identified needs, of plans to meet the needs, and how and why the plans were adopted. Although many citizens do not wish to read an entire report, they are often interested in the major findings, conclusions and recommendations. Development and distribution of a capsule report of the plan is an important public information technique.

NOTES:

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UNIT D • THE PLANNING PROFESSIONALS

PLANNING PROFESSIONALS

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THE PLANNING PROFESSIONALS

The process of planning for a school facility requires the time, interests and cooperative effort of numerous individuals. Teams of these individuals, whose degree of involvement varies from project to project and community to community, come together to create tangible realities from their intuitive feelings (Castaldi, 1987). These teams are comprised of educators, citizens and design professionals whose goals is the completion of an educational facility which maximizes an educational program.

Historically, facility planning referred to the effort of each individual community or school system to provide suitable structures to house students and teachers. Today, however, facility planning is but one aspect of a much larger process referred to as social planning (Hathaway, 1988). This process nests educational and facility planning within a larger context of planning for the entire social environment. This perspective emerged as an outgrowth of the increasingly complex and overlapping nature of the global environment. By placing educational facilities within such a framework, better decisions are possible regarding the use of these facilities as well as the judicious use of the public tax dollars which finance them. The ever increasing demands upon public tax dollars in combination with social trends of fiscal reductionism necessitates such aperspective. Hathaway (1988) crystallized these in four specific objectives for guiding facility planning:

1. Balance elements of rapid change with elements of stability.

2. Concepts of learning are associated with a variety of social institutions (including schools), stages in the life cycle, and multiple purposes of a society (work, education, recreation, safety, etc.).

3. New research in the health and social sciences documents the multi-faceted aspects of learning.

4. Education is both formal (schooling) and informal (libraries, training programs, religion, media).

School facility planning is defined as a series of sequential processes and events in which a large number of professional, technical and lay persons are engaged to achieve a stated objective of appropriate educational housing for students. This definition assumes that a stated objective or goal has been identified through some means. But even the process of identifying the objective/goal is part of the planning process. Like most planning efforts, school facility planning is a re-occurring process that is circular in nature with many feed-backloops. There is, however, an end product of the planning process and that is the school building itself. When that structure is completed and evaluated, another planning process is already in operation to maintain that building. So, one may observe that there are layers or strands of processes of planning going on at the same time.

An analysis of all the steps needed to be completed before a school building is ready for occupancy would indicate a large number of efforts would be required to produce a completed capital project. So, in spite of the fact that it is possible to look at the entire scope of the planning effort and see it as one entity, in reality, it is a series of discrete processes that go to make up the whole. While it is very desirable to have one planning process follow another, actual practice in the field would indicate that such is not the case in all instances. For example, practitioners can always cite situations where the building is planned and maybe even designed before the site is actually identified or acquired. Likewise, school buildings maybe designed before adequate financing is secured. Consequently, the sequential events are in reality not in an orderly sequence. The extreme case

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may be cited where the contractor had actually begun excavation for a new school building under the order of the school before approval to acquire the site had been obtained. Lucky resolutions to these situations is not the stuff of which good planing is made, but rather expedient planning with a great deal of opportunism. Such cases do, however, illustrate that forces outside the school system oftentimes dictate actions within the organization which then interrupt the orderly progression of the planning process.

Because the local school system is a creation of the state in which it is located, it must abide by whatever laws are passed by the state legislature. Thus, much of the planning done by the school system is governed by law. For instance, the steps in selecting and acquiring a site for a building are circumscribed by laws governing the ability of the school system to obtain and hold title to property. The school system is therefore compelled to observe these statutes. The time lines for planning activities are also proscribed by the state. The times for hearings for selected documents and actions are dictated and the school system must then time the planning activities to coincide with the specific dates by which such hearings are to be held. School administrators and school boards must always be aware and knowledgeable of whatever state law governs actions of that organization. This also applies to rules and regulations of the state board of education which have a controlling authority over local school boards.

In addition to state law, much of the planning activities of the personnel within the school system is governed by local board policies. These types of regulations are generally concerned with placing responsibility and involvement of people. School board policies always allocate responsibilities for the work of the school. These responsibilities are assigned to every division, department, office or other segment of the organization. Consequently, the responsibility for school-facility planning is then allocated to a specific person, office or department through school board policy. The persons employed in these offices or departments then have the authority of the school board to do the required facility planning and other departments do not have such responsibility. In this manner, the work of the school system is done in an orderly manner and accountability can be ascribed where necessary.

School board policies also define involvement within certain processes. Almost all school systems have policies regarding the systematic involvement of lay and community persons in various aspects of school business. Most notably, parental and layperson involvement is required by school systems in many aspects of planning because of the motivation of federal legislation and funding regulations. Such legislation oftentimes requires parental involvement. For school facility planning such involvement is not mandated by federal legislation or regulation. The local school system may, however, as a policy mandate such involvement. School planners should, therefore, be very cognizant of such policies and adhere to them.

Much planning takes place within the organization of the school system. In fact, planning is at the very heart of what theschool does. Each individual within the organization, no matter-what responsibility, does a great deal of planning. Without some sort of planning, nothing significant could take place in the school system. There are also many levels and degrees of planning from the individual in the classroom to the school board itself. In addition, there is a range of planning activities from the very simple to the complex involving the entire organization. All planning is important and should be viewed as the major vehicle which will carry the organization towards stated or implied goals.

SCOPE OF PLANNING

Major efforts of the school system are not carried out within a short period of time and need considerable planning and execution time, but there is also considerable planning that is done on a day-by-day basis. Such planning usually involves a very large segment of the organization. But to move the organization towards its goals, long term planning is required. Both types of planning, however, are necessary for the success of the school organization.

In the area of school facility planning it is impossible for a school building to be completed within a short period of time. Such an effort requires a great deal of time and effort by a large number of persons. As a result, complex long range planning is needed to insure proper housing for the educational program.

There are many reasons for using long range planning in a school system. All of them, however, deal with goals and resources which seem to be the essence of planning. The most common reasons for long range planning are:

- To identify acceptable goals,
- To properly use the resources available to the successful pursuit of adopted goals,
- To marshal staff cooperation and input into completion of goals.

The school facilities department is most closely related to long range or long term planning even though many of the activities of the personnel involve operational or problem-solving planning.

LONG RANGE PLANNING

Although most states do not mandate long range planning for local school systems, more and more states, however, are encouraging such planning to assist in the equitable distribution of resources. Even where the state does not mandate long range planning, most school systems find that this type of overall school system planning is necessary because of limitations of resources. Indeed, the more limited the resources an organization has, the more important long range planning becomes.

Where long range planning is done, it becomes the vehicle by which school systems can achieve accepted goals/objectives through the systematic allocation of resources. Thus, in order to properly house the educational program, the school system must use the long range plan. The long range plan, however, must address more than providing appropriate housing for students and programs. The long range plan is also the instrument through which all segments of the school system work to achieve supporting goals/objectives. In addition, the long range plan provides every department, program, office or division of the school system with authorization to develop an operational plan supported by resources.

It is from the long range plan of the school system that the personnel responsible for providing facilities develop operational plans for appropriate housing. This operational plan then becomes the capital improvement program of the school system and it is from this document that the school system allocates resources to provide school buildings. The capital improvement program works in tandem with the long range plan, accomplishing that portion of the plan dealing with school facilities.

The requirements for what is contained in a long range plan vary from state to state and from school system to school system. Regardless of these requirements, however, there is a need to address certain things in this document that will enable all interested persons both inside and outside of the organization to work towards the accepted goals of the school system. The purpose of the long range plan is to identify and prioritize goals, identify programs to support the goals, to apply resources where appropriate,

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and to marshal the staff resources. To do this means that certain information be contained in the document that supports the above. Most comprehensive long range planing documents address the following points:

The Community - where the school system is located and the resources available.

The Educational Program - the goals of the school system, type and kinds of services and programs offered to accomplish these, both now and in the future as well as the staff that will be needed.

The Clientele - the size of the student body and composition of that group, now and in the future.

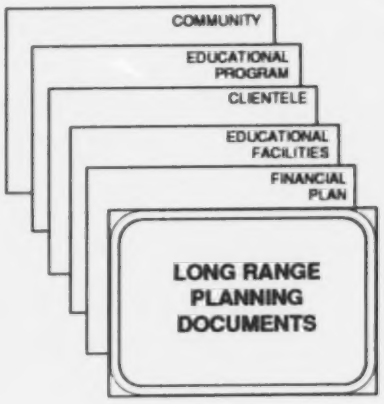
The Educational Facilities - the existing and needed facilities: kind, number and location.

The Financial Plan - the method for raising and distributing funds for the operational and capital budget.

Some office or person is responsible for compiling the document, but many people both inside and outside of the school system work in gathering data, analyzing it and writing the narrative. Whatever planning office that is in operation, usually takes the responsibility for the planning document under the direction of the superintendent of schools. In smaller school systems, the superintendent's office is usually responsible for that task, but in large school systems, an especially designated department holds that responsibility.

The long range plan serves as the genesis for many different programs and departments in the school system. In all parts ofthe school system, from the instructional to the support services, programs of action stem from that document or as a result of the document. Human resource programs, instructional delivery plans, curricular development programs, budgetary plans and even the capital improvement program result from the goals and objectives embodied in the long range plan.

The responsibility of projecting the student population is typically delegated to the Research or Personnel unit of the school system. It details the changes in pupil population, geographic growth, decline or shift, analysis of past enrollments and computations of grade-to-grade, and year-to-year trends.



One part of the data gathering for the long range plan is the evaluation of all school buildings owned and operated by the school system. The financial survey and analysis is a product of the business office and addresses both operational and capital fund needs. It details the activities, disbursements, and revenues of the school system. The cost of operation, current structures for administration, instruction, plant maintenance and operation, fixed costs, and debt service are analyzed. These data are compared with per pupil educational costs related to building cost centers within the school system and with other systems of similar size and composition.

In addition the finance survey outlines the outstanding debt, bond ratings, and bond ability of the school system for facility financing and outlines state guidelines for available outside revenues to assist in defraying local expenditures.

The report also covers the physical age and soundness of all structures and their mechanical, electrical and waste systems. It lends support to the necessity for new or upgraded facilities. In combination with the prior reports a complete picture of the physical and fiscal condition of the school system is created.

Finally, this part of the long range plan details the environmental, acoustic, heating, ventilating, and cooling demands, safeguards, and costs required by law and their potential impact on the projects total costs.

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Data from these appraisals of existing buildings are gathered into part of the capital improvement program. Likewise, the description of the educational program contained in that document helps to identify the types of teaching spaces that will be needed now and in the future. It examines content, materials and techniques of program delivery. Its intent is to discover the degree of congruence between existing programs, policies of the school board and daily practice. This survey is conducted by the educational staff — principals, teachers, and resource program specialists. Headed by the Department of Curriculum and Instruction it identifies the programmatic needs fulfilled by the current facilities and the needs and role of a new or revised facility. The excellence of a program is, in part, determined by the ability of buildings to facilitate implementation and delivery.

Similarly, projection of the clientele gives the school system an idea of the numbers of students that will be enrolled in the future. These projections when compared to the classroom capacity result in some needed action on the part of the school system. There can be a variety of activities such as constructing a new school to take care of enrollment increases, closing an old school because of student loss, adding a new wing to an existing building or renovating another school to accommodate shifting populations or to provide modern facilities. All of these data then go into the capital improvement program as projects to be accomplished in the future.

As can easily be seen, there is an inextricable relationship between the long range plan and the capital improvement program of the school system. The CIP serves to help the staff of the school system accomplish certain housing needs so that the long range plan can be executed properly, much in the same manner in which the human resources plan will guide personnel administrators to properly staff the schools with the type of teacher or service personnel required. The long range plan of the school system moves forward towards accepted goals only when the plans and programs developed from it by sub-divisions of the total organization are completed. In this manner all parts of the organization contribute to the onward movement of the school system.

The relationship between the goals of the long range plan and the capital improvement program serves to allocate limited resources to those projects that will most help the staff to successfully conduct the educational program and eliminates the competition of projects that may serve some more expedient purposes. This relationship helps the school system to have the proper school facilities when and where they are needed. Without this direct link, the school facilities department and the capital improvement program tends to become an appendage to the school organization which is then not answerable to support directly the work of the school system.

PLANNING ROLES AND RESPONSIBILITIES

Although planners come from various disciplines and orientations, they all contribute in their own way to the finished product. In addition, a large number of people are influenced by a new school building and are involved with the planning process. In order to intelligently discuss all of the participants in the planning process and their responsibility, it is necessary to categorize them. First of all there are school system planners which include the school board, superintendent, central office staff, faculty, staff and students. All of these types of people have their prime orientation within the school system. Then there are persons external to the school organization who contribute to the process. These types of people are: parents, community representatives, educational consultants, bond attorneys, and state department of education employees. Lastly, there are the design pro-

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fessionals who are the architects, engineers, and consultants. All of these people contribute to the facility planning process in some fashion.

Much of the planning that must be done to develop the capital improvement program can be done by professionals who are internal to the school system. With the exception of selected lay participation in developing the program and at the time of hearings, there is not a great deal of participation from persons other than school system employees in simply the development of the program. But there are certain parts or processes of the CIP where there is a great deal of participation by professional, technical and lay persons. Of the many processes that are accomplished in facility planning, the two processes in which there is a tremendous amount of participation by non-school system persons is in the selection and acquisition of a site and in the programming a new school. Here professionals and technicians from other professions are brought into the planning process either by design or by mandate. For instance, in every state, legal counsel is required to obtain a parcel of ground for a school site and to clear the title for the school board. These tasks cannot be done by anyone else but an attorney at law. Likewise, in the design of a building, only registered architects can manage this process. So all the disciplines that are normally required in order to complete a facility are brought together when a school system needs a new facility.

There are persons from many professions other than education that participate in the total planning process of the capital improvement program. Many of these professionals are employed as full-time school employees because of the continuous demand for such services through a heavy capital improvement program. In the case of smaller school systems such professionals and technicians are not employed on the staff, but are employed as consultants and work through contractual relationships. Only the largest of school systems employ the many professional and technical persons needed to complete a capital improvement project.

SCHOOL SYSTEM PLANNERS

The School Board. Local school boards are quasi-governmental units within each state. They operate expressly for creating, operating, maintaining, and improving common systems of public education as outlined in, and consistent with, state constitutions and statutes. They may be either elected or appointed, but are duly authorized citizen representative decision makers who formulate local policies to carry out individual state educational missions. They are empowered to hire individuals in either permanent or consultative roles to facilitate this mission (Leu, 1965; Strevell & Burke, 1959).

In formulating an educational program each local school board must first have a thorough understanding of the state educational mission. Included in the local mission plans are short- and long-range goals and the milestone objectives which measure progress in achieving those ends. This permits continuous evaluation and improvement rather than rapid and drastic shifts in direction which create confusion and enmity among staff, students, and communities.

No single issue divides a community more rapidly than those related to the provision of educational facilities. While school systems are units of the state, local boards are made up of local community representatives. Unfortunately, none of these individuals alone possess all the requisite knowledge or expertise to effectively plan a modern educational facility. The assistance of educational specialists, design professionals, other public or state employees, and user input are all needed. The complexity of planning today's educational facility requires a participative and collaborative approach to adequately address the needs of increasingly more diverse programs and populations.

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Local school boards are empowered as policy makers. As such they have an obligation to seek out, analyze, synthesize, and communicate in unbiased ways the facility needs of the local school system. They require information which permit decisions which are fair, unbiased, cost effective, and efficient uses of fiscal and educational resources. Their decisions have long term implications financially and programmatically for the local school system and must therefore focus on long-term rather than short-term results.

Long term efficiencies, cost-savings, and utilization issues must outweigh immediate pressures of initial cost containment. Too often facility decisions fall victim to other community pressures (elections, property taxes, etc.), rather than long-term cost efficiencies. Such decisions may look increasingly less rational when facilities become outdated, or require major renovation or retrofitting before original construction bonds are retired.

Each state establishes regulatory guidelines relative to facility planning, bidding, and construction. Many have minimum standards which must be met, while others require approvals prior to and during each planning and construction phase. County, township, or other municipal units may also impose specific legal mandates which must be met. Often state or regional planning authorities must be consulted, in addition to adherence to federal environmental impact requirements. Several states provide extensive fiscal support for facilities through educational facility grant or loan programs. Several permit local school systems to participate in enterprise zone or local economic development projects, while a few provide programs which cover nearly all facility provision costs (Verstegen, 1988).

Local school boards must actively investigate and take advantage of all such opportunities when planning a new facility. School boards must specifically provide some leadership, along with the superintendent in the planning process. The superintendent should assist the school board in discharging their planning responsibility. This can best be done by recommending certain action for the board to take. The identified areas of planning where the school board can assume responsibility are:

1. Approve a working outline that should serve to guide all planning groups.

2. Approve the various tasks to be performed by each group based on their expertise.

3. Appoint a central advisory committee to whom all planning groups report.

4. Approve the employment of experts and specialists to augment local efforts.

5. Provide for community input into the process and represent the broader community point of view.

6. Provide the financial support to provide modern, safe facilities.

Local boards of education are legally responsible for any facility decision, its financing, and completion. However, collaborative participation by affected groups—administrative, professional, support, student, and citizen—optimizes support of this and any future project for housing a community's educational program.

Superintendent. The executive leadership of a local school system is responsible for employing personnel who are able and willing to accomplish the purposes of the school and of executing the policies of the school board. In order to see that this happens, the school administration must see to it that personnel are available, have sufficient resources and facilities which they require for effective performance.

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These decisions must be long term in their orientation. Judgments must be made on the appropriateness of incorporating items requested for current programs which may not adequately serve the needs of future staffs or programs. As the chief executive officer of the school system, the superintendent is responsible for informing the school board of facility needs and for securing information concerning the types of data and individuals required to plan and complete an educational facility. Included here are available architectural firms whose work and expertise match those of the district, and providing potential consultants with information about the proposed project. Data-gathering includes oversight of community surveys to identify surface and underlying forces (both mores and values) on educational matters, attitudes toward facilities and their financing, and other intangible forces which may affect the timing and strategies for acceptance by the community. This, then, becomes a descriptive analysis for use by the school board in their decision process.

Next the superintendent directs a series of related specialized reports compiled by other central office specialists. These form the basis of the long range plan of the school system, as previously described.

In developing the long-range plan there is an assumption of resident school system expertise. It is highly unlikely all required expertise will be present in every system. It is the superintendent's responsibility to determine the degree of expertise located within the central staff. Demographic projections, bond ability, mechanical and environmental surveys require people who have training and experience. Local personnel must be involved, but the superintendent must determine if outside consultants are required to provide additional information, and then to communicate that need to the local school board.

Using inside or outside personnel exclusively can be a two-edged sword. Using inside personnel excusively may give rise to issues of secrecy or hidden-agendas about personnel. Conversely, sole reliance upon outside personnel may appear to devalue the school system's professional employees in the eyes of voters, the schoolboard and school personnel. The superintendent must balance the benefits of information against the financial, time, and public relations constraints of the other. The overriding criteria for employing outside expertise, however, is the availability or not of such expertise on the staff of the school system.

In summary superintendents determine local needs, personnel expertise, and data requirements. They assign responsibility for data-gathering, analysis, and interpretation to inside or outside, or combinations of personnel. They communicate and report results to the local school board, staff, and community and act as liaison between the legally responsible school board, professional educators, the design professionals, and the lay citizenry. The vision and leadership of the superintendent, in concert with available expertise, provides the working data necessary for sound policy and facility decision making by the local school board.

Other Central Administration Staff. Some school systems that have a continuous building program have need of specialized personnel within the organization on a long term basis. These persons are regular employees of the school system charged with certain responsibilities in the planning process for a capital improvement project. For the most part, larger school systems employ such persons. Large school systems usually have a need for more types of expertise because of the continuous building program. On the other hand, small school systems that are going through the process of planning a major capital improvement project such as a new school, an addition or renovation to an existing building still need all of the

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types of expertise that the larger school system does. The only difference is that for the small school system the need is not continuous. Therefore, it is not economical to have all of the planning expertise on the staff full-time. Most small school systems obtain such expertise through contractual arrangements for various consultant services.

Site Selection Specialist. This person is charged with the responsibility of assisting the organization in identifying and selecting a site for a new building or enlarging an existing site. The Specialist is knowledgeable of the geographic area in terms of available land for new sites, the school-aged population distribution, the transportation system and the present site holdings of the school system. This person is also knowledgeable about the procedures a public school must go through to obtain a site, for working through the county or municipal governments in obtaining official approval and the socio-political environment to make certain the proposed site will stand political muster. This person also works with community members in the area in which a new school will be located to help identify potential sites and to educate the public to the capital project that will take place in their area of the school system. The Site Specialist works closely with the city/county planning commission to make certain the proposed site is in keeping with the comprehensive land use plan of the governmental unit. The Specialist, in cooperation with school personnel and community representatives, prepares criteria for the evaluation of the site, meets with the total community, conducts the evaluation of the site in concert with others, either within the school system or outside and then presents the recommendation to the appropriate school official or to the superintendent so as to obtain internal approval. The Specialist then prepares the recommendation for the school board consideration and in most cases makes the presentation to that body. Although the Site Specialist is not empowered to negotiate price of the land, that person is reasonably knowledgeable to what the land is worth and what price the owners are asking. Once the school board has approved purchase of the site, legal counsel proceeds to negotiate the price and the contract for purchase. Finally, legal counsel obtains a fee simple title to the property for the school board which indicates the property is clear and free of any liens. School systems that need to identify and select at least five new sites within a period of one year would employ a site specialist full-time.

Facility Planners/Educational Planners. School systems often times employ someone to guide and monitor a capital project through the organization. This person is responsible for certain tasks and to see that other people complete their work. When a capital project is officially funded, the Facility Planner/Educational Planner assumes responsibility for seeing that the project is initiated. This may mean that all persons within the organization who will be impacted with the project meet to decide the method of working together. Once the strategy is selected, the Planner can take the initiative in developing a set of educational specifications. In some school systems that employ an Educational Planner, the task of preparing a set of educational specifications may well be done by an outside educational consultant. Whether or not the Educational Planner writes the educational specifications will depend upon the size of the project and the availability of outside assistance. In either event, the Educational Planner must make certain the educational specifications are prepared. Usually a great number of persons are involved in the preparation of the specifications by offering data, but the Planner is the one who analyzes the data and who then writes the document, if not done by outside assistance. The Educational Planner is also responsible for obtaining internal approval of the document. This is done through meetings of the staff. Finally, the Educational Planner seeks and obtains approval of

the educational specifications by the school board. This is a very important step because board approval serves to legitimatize the document in the eyes of the entire organization and community. The Educational Planner is then involved in the design phase of the project by heading the Design Review Team. The Educational Planner must assist the architect by translating the educational specifications where necessary. This person by reason of membership on the Design Review Team participates in all review sessions and actually keeps the project moving along by monitoring the progress of the architect. The Educational Planner serves as the lead person in calling review meetings and is instrumental in making certain the proper office, department or individual is involved in the review process. In this manner, the Educational Planner is the one to insure internal approval of the plans by proper review and involvement of others. In large systems this process is extremely complicated and the persons who serve as Facility/Educational Planners must keep logs, journals and minutes of all meetings to document progress and approval. In addition, the method of involvement is formally set forth through checklists, diagrams, Gantt Charts and other managerial devices and tools. The design phase is a very long and arduous one that must meet all of the requirements of the school system for involvement. The Facility/Educational Planner should also be involved with the construction phase of the project when there are decisions made about the building which may effect the educational program. At all times until the building is complete, this person may need to review or make decisions regarding the project when deemed appropriate. The Facility/EducationalPlanner may also make presentations regarding progress of the project to the school board, various community groups to keep them informed and to internal groups of educators. This person serves as an interface between the architect and the educational community within the organization and the lay community. The Facility/Educational Planner should be an individual who is very knowledgeable about the field of pedagogy and trends in education. In addition, the Planner should have some knowledge of the design process and be able to read and interpret architectural drawings. The person should also be very familiar with planning and organizational models to be able to use this knowledge in working through the school organization. In school systems that do not employ a full-time Facility/EducationalPlanner, the work is done on a contractual basis by an outside educational consultant.

In-house Architects. Many large school systems employ a full-time registered architect on the staff to do certain design work and to review the work of outside architects. Again, the need to have an in-house architect would be governed by the amount of design work that the school system has in any one year. Such architects usually work on projects that are small and which are not economical to contract out to an external architect. The projects are also very specialized and indigenous to the school system. The in-house architect does not design a new building, for example, because there is not enough support staff. Nor would the person be a liaison to the external school architect because this would not be the best use of the talents of that individual. The in house architect may administer a department of design and construction in which individuals who have responsibility for monitoring the construction phase are located.

Project Managers. Most school systems want the school architect to have only one contact person to gain access to individuals within the organization. This facilitates the work of the architect because that person does not have to spend valuable time determining who to see and when a meeting can take place. To prevent the architect from literally having to wander around the organization to obtain information about the project, school systems designate a single contact

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person for the school system. The architect then has one source of information and one contact. The contact person may have various titles such as Project Manager, Project Supervisor or Architectural Liaison. Regardless of the title, the work of the architect is greatly facilitated by having only one person to contact in order to obtain information. The Project Manager should be an individual who is knowledgeable about the design phase and perhaps the construction phase also. Some school systems employ registered architects for this position. With this kind of expert training, a Project Manager can be invaluable to an external architect in answering many questions dealing with specific design features the school system would accept or desire and those unacceptable. When a specific project is authorized to start and the architect has been hired, the Project Manager begins the close relationship between architect and school system by scheduling the kick-off meeting. The Project Manager is the person who schedules meetings with the architect and with those persons inside the school system the architect wishes to see. Inquiries from the architect are funneled through the Project Manager to the appropriate person within the organization which in most cases is the Facility/Educational Planner, and the information is sent back to the architect. This seems to be a very efficient method of obtaining information in a systematic fashion.

Construction Supervisors (Clerk-of-the-works). Construction Supervisors and persons who provide supervision to the building project during the construction phase. This person is usually employed by the school system to provide full-time supervision of the construction process and is not employed by the architectural firm. Sometimes people call this person the Clerk-of-the-works. This term is not the best to use because that term is used by the architect to designate the type of supervision provided by that office. The architect's contract states that supervision by the Clerk-of-the-works will be provided, but this type of supervision is for the architectural firm and not necessarily for the school system. For that reason, most school systems use the preferred term of Construction Supervisor to designate someone employed by the school system to provide construction supervision. Some school systems call that person the Construction Manager. This term should also be avoided because it now has the connotation of a firm that provides supervision of the construction phase and other services. The Supervisor is the representative of the school board and the entire school system at the construction site and it is that persons responsibility to see that the building is completed in a timely fashion with good workmanship using the specified materials. This is a tall order for one person, but with proper training and experience, the Supervisor can do a good job and save the school system considerable time and resources. The person employed should have some knowledge of the construction industry and should have some experience in some phase of it. This combination will well serve the school system. The formal training may take the form of a building trades course in secondary school or community college followed by several years working in the industry. A person who has operated as a contractor and was licensed by the state would be an excellent candidate for that position. The Supervisor maintains logs, records, minutes and journals recording the progress of the project. That person is guided in that work by the architectural plans, schedules of materials, technical specifications and timelines. From these sources of data, the Supervisor is readily knowledgeable about what should be in the building, what it should look like and when it should be finished. With this information, the Supervisor conducts weekly job site meetings with the representative of the contractor and architect. The purpose of this meeting is to ascertain the progress of the project, notify the contractor of certain conditions, discuss possible changes to the contract, determine

materials being used and assess the quality of work. This job-site meeting solves many problems and averts others that might have arisen. Because the Supervisor is the representative of the school board at the site it is incumbent upon that person to make certain the organization receives good measure for the funds that are being expended. The Supervisor provides daily supervision to the work of the contractor and can anticipate problems and conditions which may effect the work of the latter. Through daily contacts with the contractor, the Supervisor can provide information that will help the contractor fulfill the contract on schedule. Through the appropriate recordkeeping, the Supervisor keeps the school board well informed of the progress of the building and reports any changes or conditions that might need the attention or action of that body. As can be seen, this is a demanding job, but if done properly, will save the school system considerable resources and produce a product that will well serve the organization.

Faculty/Staff/Students. The complex educational programs in existence today require facilities which effectively optimize their delivery. No group of individuals are more acutely aware of the strengths and weaknesses of existing facilities than are those who use them daily. The building teachers, support staff, and students can provide valuable information on the necessities and amenities which facilitate or impede educational program operations.

Participation & Collaboration. So we asked them what they wanted and they said, 'Well, what have you got?' So we went back and made up some drawings. We showed them what we had and they said, 'That's not what we want.' So we said, 'Well, what do you want?' and they said, 'Well, what have you got?'" (Stokols, 1983)

Involving faculty, staff, and students goes beyond asking, "What do you want?" Needs and wants can vary and are subject to the desires of today rather than the necessities of tomorrow. In order to develop accurate educational specifications it is often necessary to engage in a series of discussions on spatial, programmatic, and amenity prioritizing.

These prioritizing sessions may be held as small or large group meetings where individuals from departments, or subject areas, are asked to identify requirements for each program or space. Tallies are made and open discussions on discrepancies are aired. The goal is to reach consensus by users on the functions and requirements of spaces and program goals. A facilitator is required for leading each round and guiding the discussion to avoid negativism or non-participation. The goal is consensus. It is essential the facilitator is an educational consultant with prior experience in facility planning to obtain the maximum results. This permits building administrators to participate as equal members of the planning/decision process without placing them in a hierarchical role. It also insures administrative needs are not overlooked in the priority listings without devaluing the perspectives of teachers, support personnel, or student users.

The results of these sessions are incorporated in the educational program report and serve as the basis on which educational specifications will be written. It insures specifications reflect long-term program and subject matter priorities rather than current "wish lists."

School buildings will out last several generations of students, staff, and administrators. An average school building has an active life of 30-50 years. It is therefore critical that buildings be collaboratively planned to ensure ownership by the users, but also focus on long term programmatic effectiveness and flexibility.

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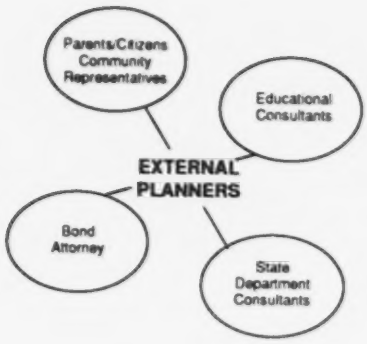

EXTERNAL PLANNERS

Parents/Citizens/Community Representatives. There are several reasons why lay citizen/community participation should be included in the planning of educational facilities. First, public schools belong to the people who reside within a local area. These individuals pay, through state and local taxation, for the support of the educational system, and therefore public accountability is enhanced when in addition to serving on school boards, booster clubs, or sending their children for educational services, citizens have a voice in the type of educational facilities planned for their communities.

Second, increasing stress on local tax dollars, and the gentrification of the U.S. population in general, means fewer taxpayers with school-age children. Participation and information dissemination on facility planning needs ensures a continuing support base for the educational activities of a school system.

Third, re-emergence of the combined "community-use" public facility is once again occurring nationwide. Multiple use facility keep individuals engaged with the missions and goals of public education relative to community goals and needs. Use by such groups as park districts, libraries, senior citizen and community theatre groups in evenings or on weekends permits efficient use of declining public tax dollars.

Fourth, extension of use of educational facilities for early childhood programs, adult literacy, or social programs is a powerful and visible means for schools to extend equity, equality of opportunity, and efficiency mandates to a greater range of citizens. In every community there are increasing demands for enhanced safe and educational child care options for dual career or single-parent families. Similarly, urban sprawl and mobility has all but eliminated local extended family groupings. The two-way reciprocal social benefits derived from community participation in the planning and use of public school facilities is essential for continued long term health of the public school system.

Educational Consultants. Educational Consultants serve the educational system of the country in many ways. Consultants are called upon to solve problems of every kind and nature so that the school system can benefit from the thinking of outsiders. Consultants bring the objectivity that school personnel sometimes can not give to a problem. In addition, consultants can save the school system considerable time in gathering data, analyzing it and producing an acceptable report that can serve as the basis of decisions. This is the very heart of what a consultant can do for an organization. The data demanded to solve a problem is almost inevitably found within the school system. Being able to adroitly analyze the data and offer sound alternatives, however, is the real benefit of this type of assistance. Consultants usually are contracted by the organization to solve a definitive problem or to complete a specific task.

In the area of school facility planning, Consultants may be asked to prepare financial packages, project student populations, evaluate buildings, develop capital improvement programs, write a set of educational specifications, monitor the design phase, prepare an organization scheme or all of these. The scope of the work depends to a great extent upon the size of the school system and the project under consideration, however, all school systems, regardless of size, needs the expertise of educational consultants at some time.

Bond Attorney. Every school system has access to legal advisement through the local elected governmental attorney. This can be through the office of the County Solicitor, Commonwealth Attorney, District Attorney, County Attorney or some other designated legal office of the local

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government. In addition, most school systems contract with a private legal firm for services and to represent the school board in the courts. When the local school system desires to go into debt through the issuing of general obligation bonds, however, special legal assistance is then needed. In these cases, the school board hires a legal firm that specializes in municipa! bonding procedures. These firms provide attorneys to do several needed things for the board. Bonding attorneys advise the school board on the legal procedures to observe in conducting a bond referendum, the legal wording of resolutions and the correct form and wording of the bond itself. In addition, bond attorneys make certain that each bond conforms to all state laws and regulations and can be legally sold by the school board. The attorney may also advise the school board on proper procedures for marketing the bonds and methods for disposing of the bonds. The field of municipal bonds is very complicated and needs the sage advise of someone well versed in that special aspect of law. School boards must contract with the best available legal bond firm to obtain needed expertise to handle this intricate matter.

State Department of Education Consultants. The department of education in each state is charged with the responsibility of developing regulations governing the local school systems and overseeing the work of that part of the state government. The amount of regulation of the local school system depends upon each state, but state rules and regulations nevertheless control much of what happens on the local scene. This variance in control, service and regulation applies also to school facilities. Some states have a great deal of regulation regarding local school facilities and what can be built; whereas other states have very little control over the number, kind or quality of building that is constructed.

In the same manner, some states provide the local school system with a great deal of planning services. The reverse of that also exists where very few facility planning services are available. Of course, there is considerable program planning services available in almost all state department of education offices. These services are valuable to the local school system to inform them of trends in a specific discipline or level of education or regulations of the State Board of Education regarding the subject or level. State department of education professionals also help the local educators plan to incorporate these trends and regulations in future programs. All of these program consultations are helpful and important.

In addition to these services, some states also provide services to help with a capital improvement program. These services in some states are so extensive that state department consultants can help the local school system develop an entire long range plan. These services range from organizational design, demographic analysis, financial capacity analysis, building evaluation, educational specifications development, monitoring the design and construction process and even helping organize an orientation to the new building. Needless to say, the states that offer these services have a large staff with which to do that work throughout the state. In some states, these services are free for the asking and the only restriction is time such services are available.

Many states require the architectural plans for a new building, an addition or a major renovation to a building be reviewed and approved by them. This usually entails the completion of certain forms and a few review sessions with the appropriate personnel in the department of education. Local school boards and administrators need to know what services are available from the department of education and further need to be very familiar

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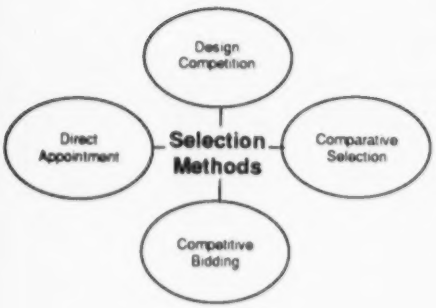

with the rules and regulations regarding capital improvement projects and the financing of them.

DESIGN PROFESSIONALS

Architects. The architect is one of the most important person in the planning process for a new school. This person must provide the expertise to conceptualize the building in such a fashion that the end produce will serve the educational program well, fit into the community and provide an asset to the neighborhood. This is not an easy task, but rather a difficult and time consuming one. The architect is also the lead person on the Design Team to guide the project through to completion. A great deal of attention needed to be paid to the process of selecting the architect for a school-capital project. Whatever efforts are made in this process will pay great dividends to the school system in terms of a workable facility.

In order to practice the profession of architecture, a person must have the proper training and experience to be licensed by the state. Only those persons who have met the qualifications asset by the state can receive the designation as a registered architect. This designation is important because only a registered architect can apply a legitimate stamp to a set of drawings. This is the method the state has for guaranteeing a certain standard of work in designing a structure. Needless to say, only registered architects can be employed to design a building for a school system.

There are several ways to select an architect for design work. The Council of Educational Facility Planners lists four methods of selection: direct appointment, design competition and competitive bidding and comparative selection (1985). Although all methods have been used to employ an architect, some are better methods than others in obtaining excellent services.

Design Competition. This type of competition is where the school system selects certain architectural firms and submits a given program to each firm. In turn, each firm comes up with a solution to the design problem. The program could be a masterplan for a campus, design for a new building or even a major renovation of an existing building. Each firm completes the solution and presents it to a jury which may be composed of school personnel, community persons and perhaps other impartial architects. The jury selects what seems to be the best solution in their estimation. The winner of the competition is then offered a commission to complete the project. There are some very distinct disadvantages to both parties in this method of selection which must be recognized. First of all, the architectural firm must expend considerable resources in doing some up-front work for which they may have only a 1:4 or less chance of getting a commission. Most firms justifiably do not like these odds, which is very understandable. On the otherhand, the school system is then taking a chance that what each firm brings to the competition is what is wanted and this is not guaranteed. In other words, the school system is giving up any input into the solution in the first place and then must accept what the architect believes they need. This type of non-participation that school systems throughout the country decry. No school system should really want this, no matter how good thepanel of firms may be considered.

Direct Appointment. Some school systems select an architect based upon what they know of that firm. A local architect may have done work for a school system before and the work was good, therefore, that firm is selected for other projects. The firm is usually known by school board members and school personnel because of either previous work done or by reputation in the community. No matter what the situation, school systems do employ a selected architectural firm without comparing that firm with another. Usually, the work of the architect selected under this arrangement is very satisfactory and the situ-

ation works very well for both parties because of pervious associations. There is, however, a danger to this method of selection that school boards should guard against. There may be a tendency for a school board to employ the same firm repeatedly. In these cases, firms may use the same solution to every design problem the school system has. In some small school systems, there may not be more than one firm available to them and in these cases, the direct appointment may be legitimate. But where other reputable firms are available, this form of employment should be avoided.

Competitive Bidding. This type of selection procedure uses the bid for services as the final criteria for employment of professional services. As can easily be seen, this criteria may well become the most important one in finally selecting a firm. Of course, the design fee a school system is willing to pay for a project is not the most important criteria to use in selecting an architectural firm. Competitive bidding may work very well for the procurement of materials and some services that are measurable, but it is not a productive method for securing professional services.

Comparative Selection. This is probably the most often used method of selection of an architectural firm for school buildings. Through this means, a school system selects the architect from a group of candidates who have been evaluated based upon data supplied by the firm. The comparative selection is basically a way of looking at more than one architect and then choosing what seems to be the best suited one. Although this method of selection is long and laborious involving considerable staff time, it seems to produce the best results. The method is very little different from that of selecting any professional to work for the school system, however, more time is involved in gathering data.

Like any employment situation, the school system must first of all develop some criteria by which to evaluate the various applicants. In this case, however, the evaluation is made on a firm, not an individual. Selection criteria are usually developed by the school staff or in conjunction with lay groups. Each school system must develop their own specific criteria, but usually the following should be included:

a. Registration and Professional Reputation
b. Experience, especially with school systems
c. Creativity and Imagination
d. Methods of Cooperation
e. Staff and Facilities
f. Interest in the project
g. Quality of Previous Work
h. References

The school system must first of all determine the receptivity of architectural firms to a commission. This is done by letter to prospective firms detailing the project under consideration and asking for their interest. Those firms that are interested will send certain data requested by the school system. Based upon the data response and perhaps an initial interview, the school system employees evaluate each firm and develop a short list of firms in which they are interested. Each firm on the short list is then evaluated further in order to narrow the field to either one firm or at most two firms for the school board to consider. The school board then may interview the firm for additional data input or they may take the advise of the staff and employ their recommendation. In any event, the architectural firm is hired and placed under contract.

The American Institute of Architects does have a contract that can be used in legalizing a working relationship between a school system and an architect, however, more and more school systems and states are developing their own contract which contains specific clauses to meet state law and local policies. These locally developed contracts cover all necessary conditions applicable to the particular state and can address specific concerns of

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the school system. Even the AIA contract should be modified to meet local situations and concerns. The legal counsel of the school board and in one state the department ofeducation, must review and approve all contracts with architects before they can be executed by the school board. Regardless of the origin of the contract, the usual services stipulated in the contract covers the following:

a. Schematic Design
b. Design Development
c. Development of Contract Documents
d. Bidding Monitoring
e. Construction Monitoring
f. Orientation and Evaluation

Sometimes architects will offer school systems some pre-design planning services to secure a commission, but usually these services are very narrowly defined. Architects generally charge for services required over and above those listed. School systems must be knowledgeable about what services are and are not included in a contract before it is executed. The one area of most concern is that of construction monitoring. Some school systems erroneously believe when the architectural contract states that periodic monitoring of the construction project will take place, this means daily or at best weekly visits to the site. Such is usually not the case for the clerk-of-the-works as provided by the architect. This is just one area of possible misunderstanding. Careful negotiation and understanding of the contract by both school board and architect will prevent such situations. More importantly, the school system should provide its own construction supervision to insure the best results in monitoring the project.

The fee of the architect is negotiated by the school board and is usually determined by a percentage of the total construction cost of the project. This is the industry-wide basis for employing an architect based upon the amount of time and expertise necessary to properly design a project. This method for setting fees should be adhered to by the school board for the best services of an architect. Occasionally a school board will consider awarding an architectural commission according to the lowest bidder from a group of firms. This practice is not in the best interest of either the school system or of the architectural firm and is simply not the way to get the best possible professional services.

Architects are paid the agreed upon fee upon presentation of a proper invoice detailing the work done. Payments usually reflect the completion of the various phases of work. When the architect completes each of the agreed upon phases the school system has generally paid the firm the following percentages:

Schematic Design	15%
Design Development	20%
Contract Document Completion	40%
Bidding Phase	5%
Construction Phase	20%
	100%

The contractual relationship between the school board and the architectural firm is no different than any other relationship. The firm is expected to complete certain professional services in return for adequate compensation. In facility planning, the architect and engineers are simply members of a larger team of experts who are planning and designing a school facility project. The architects and engineers are not decision makers for the school system, but are rather members of a team who offer solutions so that decision makers can actually do their jobs. Architects or engineers should not be forced into the role of a decision maker by the school system. Sometimes school boards and educators do not provide the amount of leadership demanded of the situation, and they abrogate their right to make decisions. In such leadership vacuums, some architects do become decision makers. This is not a good situation for either party, because the architect may end up making decisions that should be made by the educator. School boards and educators should recognize their right and responsibility to make decisions

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regarding the planning and designing of the school building and discharge it accordingly.

Engineers. Engineers are a vital part of the Design Team from the beginning to the end of the project. Many types of engineering expertise are needed to completely design and engineer a school facility. The traditional disciplines within the field are represented by structural, mechanical, electrical and civil engineers on every building project. Their roles generally coincide and work with the architect during the design phase. The engineers in each of these disciplines work to plan an important sub-system within the general design concept of the architect. Each sub-system contributes to the overall working of the completed building, such as the electrical, plumbing, heating/ventilation/airconditioning, communication and structural system.

Most large architectural firms and school systems have engineers on the staff to assist with engineering systems. For small firms and school systems, this type of expertise is acquired through engineering consulting firms under contract. In certain building projects very specialized engineering expertise is required to assist in solving a highly technical problem. When this occurs,the special expertise is added to the Design Team. Persons representing such highly specialized engineering expertise as acoustical control, theatre design, energy management and communications are brought into the design phase.

OTHER CONSULTANTS

Interior Designers. While both architects and engineers are capable of providing services related to layout of interior spaces, design of custom-built items, and selection of furniture, fixtures, and equipment, most design professionals would agree interior designers are necessary. Commercial design specialists are familiar with current equipment lines, costs, availability, delivery and installation schedules. They are trained to bring unity and harmony of color, texture, use, form and daily function together. Interior specialists are trained in the behavioral aspects of human/space interactions and designing humane working spaces with overall aesthetic quality. They can produce layouts, sample boards of fabrics and finishes, or produce models to graphically illustrate their interpretations of client needs and desires and their attendant cost implications. Professional oversight is provided by the American Society of Interior Designers (ASID) who establishes standards of professional practice and ethics.

Library Consultants. This profession emerged during the 1950s (Cohen, et al, 1979) when a great deal of interest and money was devoted to removing the "stale" and "scholarly" image from libraries and making them more user friendly. Library consultants may hold degrees in library science or be specialists in only one aspect of library usage such as media or equipment systems. They can evaluate existing facilities, prepare feasibility studies, help solve spatial, storage, or archival problems, and write educational library specifications.

Fees are generally flat fees or hourly/daily rates since most library consultants hold other full-time employment. However, unlike managerial or interior consultants, written narratives are usually required and therefore fees are seldom on a per-room or square-footage basis.

General Consultant Information. In addition to the specialty consultants mentioned above there are also others which a school system may find necessary for particular projects:

- Management
- Landscaping
- Lighting
- Acoustical
- Computers
- Energy
- Athletic/Recreational
- Kitchen

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There are no definitive rules for selecting specialized consultants. Their use is dictated by the client's needs, scope of the project, and qualifications of other design professionals, and sometimes by state or local restrictions. Seeking input and referrals from other satisfied school systems is often the best, and most efficient, way to seek out the names, reputations, available services, and fees of such individuals and firms. There are, however, a few questions which can guide the selection process:

1. Does the firm/individual have a reputation for completing contractual obligations on time and within the budget?

2. Is the same degree of interest and attention given to small projects as to very large ones?

3. Does the individual/firm appear able to work with the planning team?

4. Do they listen?

5. Are they so big (or small) that service is not a high priority?

6. Will the persons you meet actually be performing the work, or will someone else?

7. Are they willing to furnish a list of completed projects/references?

8. Do they publish their standard fee schedule and willingly disclose information about the firm, its owners, and professional staff?

There are no guarantees that the best consultant will be selected, however, asking good questions, checking references, viewing photographs, visiting completed projects and frank, open interviews will go a long way toward selecting highly qualified, competent and ethical consultants for any school facility project. Most school systems require prior approval of engineersand consultants before the architectural firm can use them on a design project. This is a wise safeguard for the school system

DESIGN TEAM/DESIGN REVIEW TEAM INTERFACE

After the Educational Specifications for a capital improvement project have been approved by the school board, they are given to the architect to use in designing the building. The architect then marshals the staff to work on the project. In large architectural firms, a wide variety of competence is regularly employed. In a small firm, however, some of the engineering competence needed to complete a project is employed either part-time or on a project basis. In any event, not only architectural expertise, but also engineering expertise is needed to complete the design of a project. The architect puts together a team of experts which is called the Design Team. This group of individual professionals are then responsible for completing the design work for the project.

Engineering expertise on the Design Team usually follows the traditional disciplines associated with the engineering/construction industry. If the project is large enough, such as a complete building or an addition to an existing building, the Design Team may have separate full-time engineers for all of the disciplines such as electrical, mechanical, structural and plumbing/heating/ventilation systems. For small projects, however, some of these disciplines may be covered by temporary consultants. There may also be very specialized engineering expertise needed on some projects such as communication systems, theatre design, landscaping or natatorium design. Likewise, special problems may require engineering expertise to address issues of acoustical control, asbestos removal or insulation treatment. Individuals with expertise in all of these disciplines are brought together on the Design Team.

The Design Team is a very flexible group, expanding when certain expertise is needed and then contracting to

a core group, but each person is responsible for a certain part in the design of the project, whether it is in actual design work or in the engineering of the project. When design consideration is given to a certain part of the project, specialists in a given field may be brought into the Design Team to work out a problem. That person will contribute to that aspect of the project and may not be called upon further. In other words, the Design Team is expanded to include expertise when needed, but the core personnel are always included in the work. Each person brings not only individual beliefs and attitudes as to how a building should function, but also the expertise in their particular discipline to work together for the common goal of designing a new capital project, regardless of the nature or size of that project.

The Design Team is also supported by a cadre of drafting specialists, computer specialists, technical writers, technicians, secretaries, artists and others who provide specialized assistance in the development of the project. Each has a very important part to play in the project from the conceptualization through to the evaluation of the building. This support team is usually located in the architect's office and responsible to that person, but without these individuals, the Design Team could not function very effectively.

To properly review the work of the Design Team, the school system should organize a Design Review Team. This team should also assist in the interpretation of the educational specifications to the Design Team. These two functions are very important for the smooth and timely development of the capital project. The Design Review Team should be headed by the person who wrote the educational specifications. In some school systems this person is called a project manager, facility planner, educational planner or school planner. Regardless of the title, the person who was responsible for the development of the educational specifications should head the Design Review Team. The second person on this team should be someone high enough in the hierarchy of the school system to be able to make decisions regarding the design of the school building and those decisions will prevail without having to go to the school board for every decision. This person may be the assistant/associate superintendent, an administrative assistant or someone other person high in the school system. In large school systems, the person may be on the director's level and in the smaller schools may be on the superintendent level. The main qualification is that the person is reasonably knowledgeable about the capital project and trusted enough by the organization to make some decisions. This is very important because to bring every decision to the school board for their action would hamper the timely development of the project and unnecessarily slow down the architect.

The third member of the Design Review Team should be someone who is familiar with the manner in which a school organization operates. Such a person might well be a principal because that person ought to know how a school is organized and how it operates on a daily basis in a given school system. This person often times will see conditions or features in a specific design that may cause traffic, educational or discipline problems for the staff that other persons may not see immediately.

This team of three permanent members should be augmented by other individuals who possess specific expertise as the need arises. For instance, when the Design Review Team is reviewing the plans for the vocational complex in a new building, the director or supervisor of vocational/technical education of the local school system should become a member of the Team for that and any subsequent review sessions of those plans. That person should also give final approval of the plans for the vocational complex. Likewise, other persons with

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special areas of expertise will become members of the Design Review Team when their area of the building is under consideration. The directors of transportation, libraries, maintenance, cafeteria, language arts and physical education, just to mention a few, should become members of the Team when areas they are concerned with come under review. Thus, the Design Review Team, just like the Design Team, expands and contracts according to the expertise needed to properly review the plans under consideration. In as much as the Design Review Team spends a great deal of time reviewing plans, it is not very feasible to have all members of the Team involved constantly. Similarly, not everyone is equally interested in all parts of the building to spend time reviewing all of the plans. Therefore, the Design Review Team is a fluid body of individuals that includes a great many areas of expertise that are used when needed.

Every step the Design Team takes in developing the design of the building is monitored and reviewed by the Design Review Team. The review sessions should start with the kick-off orientation meeting with the Design Team and should continue throughout the design phase until the completion of the bid documents. The Design Review Team should also be involved in any review of plans for possible cost reduction even after the bids are awarded. This group should be responsible for any development or reduction in architectural plans, regardless of when it happens. The frequency of the review sessions will depend to a great extent upon the development of the project. If a project is proceeding in a normal fashion, the review sessions might be as frequent as each week. The point of the sessions is to give guidance to the Design Team and to interpret the educational specifications in light of building design. This will require very frequent meetings between the two teams. Design review meetings will continue to the point of beginning construction. Final approval of the plans must be given by the Design Review Team representing the school system.

EQUITY, EQUALITY, ADEQUACY, EFFICIENCY & FREEDOM

Planning of today's educational facility must be conducted within a complex framework of social and judicial decisions. Each enlarges, and simultaneously restricts, the choices planning professionals may make. Issues such as equity and equality of opportunity, adequacy, efficiency and freedom must all be considered in every decision made by school system planners and especially in making school facility decisions. School facility planners must constantly keep these in mind in order to comply with legal requirements. These issues and concepts are translated into specific behavior, the result of which can be judged to be in compliance. Nevertheless, facility planners should be very knowledgeable about these issues and concepts and know their impact upon facilities and be able to assist the school system to implement them.

Equity and Equality of Opportunity

Provision of educational programs has seen dramatic changes since the 1950's. Beginning with the U.S. Supreme Court decision that "separate but equal" was unconstitutional (Brown vs. Topeka Board of Education, 1954) and continuing through more recent mandates for handicapped accessibility (P.L. 94-142), sex equity in programs and facilities (ESEA, Title IX) as well as growing levels of disaffection with the quality of American Education (Risk, 1983; Carnegie Task Force, 1989), planning efforts and the individuals who undertake them have had to plan and include appropriately for both equitable, and equal, opportunities in programs and facilities. For facility planners, both inside and outside the organization, this concept means that comparable and equitable facilities must be available to all stu-

dents on a state-wide basis and also within the school system. Each neighborhood school should have the same type of physical facilities as the other and the facilities should be in as good condition as the best facility in the school system. To comply with the equity issue, school facility planners must work to up-grade all existing facilities in both condition of repair and specific building spaces available.

Adequacy and Efficiency

Adequacy is traditionally defined as dollars/student expended. However, a relatively recent state court decision outlines what amounts to a judicial standard for adequate educational facilities:...[School] facilities must be structurally safe, contain fire safety measures, sufficient exits for safe and easy flow of traffic, and adequate, safe and potable water supply, an adequate sewage disposal system, sufficient and sanitary toilet facilities and plumbing fixtures, and adequate general instructional, administrative, and custodial storage. All facilities must be adequately lighted, in good repair, and attractively painted. Facilities must be designed to prevent loud noises from traveling from one section of the building to another. (Pauley vs. Bailey, 1982).

While other definitions of adequacy have been normative in orientation (McCarthy, 1981; Ward, 1988) it is receiving increasing levels of interest by school finance experts (Hickrodet al, 1987).

Efficiency is often interpreted only as an expenditure issue, but also refers to the facilities themselves. Well planned programs are enhanced by facilities which optimize their delivery. Additionally, such planning increases the likelihood for higher levels of efficiency in space, lighting, and energy utilization. This, in turn, produces more economical facilities. When humanely designed these educational environments increase perceptions of ownership and pride, which reduce vandalism and abuse maintenance costs, in addition to operational and construction dollars.

Efficiency is also aided through use of such techniques as environmental scanning, making timely decisions, or competitions in timing (CIT) (Ward, 1988) which recognizes decision timing has a critical effect on saving dollars.

These educational issues reinforce the need for well thought out long range plans.

Freedom

The freedom to choose not only ones workplace, but the configuration of that workplace, by participation in the planning team, enhances voter choice and support for facility projects. As Hathaway (1988) points out it is important to . . . satisfy the broadest array of societal needs . . . (p. 14) possible.

NOTES:

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UNIT E • EDUCATIONAL SPECIFICATIONS

EDUCATIONAL SPECIFICATIONS

Prepared by:

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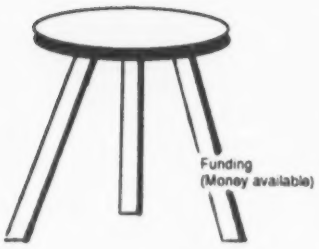

Figure 1.

EDUCATIONAL SPECIFICATIONS

During the period since 1950, the design of educational facilities has increasingly been enhanced by the preparation of detailed client/owner requirements. Although the development of an educational program of requirements document is well recognized by those regularly engaged in facility planning, there is wide divergence in thinking about how the document should be produced. Much of this variation in thinking derives from a lack of clear understanding of the roles and responsibilities held by those necessarily involved in planning new schools.

This somewhat troublesome ambiguity is reflected in the title selected for this Unit of the Guide. Does the process of preliminary educational planning produce "educational specifications"? Architects and engineers prefer the term "specifications" to describe the technical document accompanying the drawings used for construction. Terms such as "user needs" or "educational program requirements", normally describe the content of documents outlining the educational decisions about what to build. The terms "educational specifications" and "program requirements" can and should be used interchangeably to refer to the facility needs as derived from the educational program.

There seems to be fairly wide acceptance of the functional nature of "educational specifications" despite the variation in labels. Dwayne Gardner, former Executive Director of CEFPI, has provided this definition:

Educational specifications (serve) as a written communication from the owner, or the educator, to the design professionals, particularly the architect, describing the educational activities that the school plant should accommodate, present and future.

Planning for educational facilities can be understood best when all people involved recognize the two fundamentally different intellectual processes in problem solving. The first is the scrupulous attention to articulating needs. The second is attention to identifying as many workable solutions as possible. The planning process that focuses on the existing and projected needs of the school system for physical spaces to accommodate the instructional programs of the community can be termed needs-based. Solution-based planning is primarily the domain of the design professional staff, and focuses on synthesizing alternative solutions to meet the described need.

It should be recognized from the outset that architects and engineers are not necessarily knowledgeable about the needs of an instructional program. In addition, wide variations in educational methodology magnify the need for careful preparation of the "educational specifications." Most educators are not architects nor engineers and should not be expected to assume responsibility for design. Through the development of the educational specifications the school district representatives are provided an opportunity and a responsibility to engage in the educational planning aspect of providing new schools and to do so in the context of education's needs as interpreted by educators. The architects can then translate those educational decisions into a design for a facility. The design professions ultimately deliver to the client comprehensive plans and specifications for a structure that will effectively provide for the implementation of the educational program. The planning process is clearly a joint task performed by the client (educators) and the architectural firm.

The relationship of educational specifications (the owner's responsibility) to the total planning process is well illustrated by Allen Weymouth's graphic presentation (figure 1) depicting the options provided to the architect.

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To make the stool level and in balance, consideration of all three legs are basic considerations. The owner's responsibility is to determine *two*; the architect has the task of developing the *third*.

In this conceptual approach, the program requirements are represented in Function, one of the three legs of the stool. The school district usually will determine (control) Function and Funding. Form then becomes the initial province of the architect, although it is apparent that the three aspects illustrated are interrelated. Therefore clearly the best facilities result from appropriate cooperation planning.

This preliminary discussion indicates the importance of the development of program requirements to the total process of educational facility planning. Of specific concern are these related questions: What are the characteristics of "educational specifications"? What does the development process include? Who should participate in the preparation of educational specifications? Should the educators be concerned with standards for buildings? Is there a desirable format, or model, for "educational specifications"? These questions, and others, are treated in this Unit of the Guide.

THE DEVELOPMENT PROCESS

The process of developing a set of educational specifications can be appropriately analyzed in terms of the extent of participatory planning. There cannot be any assurance, of course, that the broader the participation the greater the quality of the plan. However, a considerable body of evidence suggests that "user" input tends to strengthen the functionality of facilities. "User" in this context refers to students, classroom teachers, administrators, specialized staffs, school board members, and parents. Community members are also occasional users of the facilities and should be given opportunities to suggest, react, and evaluate plans, especially in the context of community education and other public oriented aspects of the project. There is no one set function for programming educational specifications. The format should result from the nature of the project. Generally, broader representation is desireable to permit a wider range of ideas and knowledge.

Participation can be viewed as points on a continuum representing a closed-to-open philosophy as shown below:

PARTICIPATORY PROCESS
PLANNING OF EDUCATIONAL SPECIFICATIONS

Closed Process — A — B — C — D — E — Open Process

A. **Architect/Administrator**
Input and decision making primarily in the hands of two or three professionals. Only token efforts to solicit ideas from the direct user group.

B. **Small Team**
Expertise carefully solicited from individuals with established knowledge and experience consensus decision making tends to be highly centralized.

C. **Select Group**
Differs from large group in that there is broad representation by a few people with recognized expertise. Group brought together for intensive carefully organized decision making.

D. **Large Team**
Includes designated central administrators, building level administrators, teachers, staff, students, board representatives, community representatives, consultants and architects. Emphasis is on broad based input and consensus development. Work of large teams may extend over weeks or months. Decisions are usually conventional and user supported.

E. **Open Team**
Technique stresses participation of the diverse components of the community affected by the building program. Community involvement is aided by professionals. Brainstorming often serves as a catalyst for change. Public support is generally enhanced.

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The basic premise for participatory planning is that more heads are better than one. Improved planning and better educational buildings will result from the involvement of a more comprehensive planning team. Admitting, broad "ownership" of plans derived from participation usually increases the positive vote on bond issue elections, but the manipulation of citizen groups for this purpose cannot be sanctioned. Participatory planning has its legitimate rationale in a sincere desire to assure a functional school building that serves its users to the greatest extent possible.

The emphasis on participation should be viewed in terms of the factors which tend to assure that those who participate will be productive.

Important factors are:
- Desire to be part of a group and support its decisions
- Time available to spend on the project
- Knowledge about the project
- Ability to work with people
- Commitment to the improvement of the school and community

ED. SPECS TASK FORCE

The task force participating in the development of "educational specifications" can best be organized if the various responsibilities of individuals and groups are well formulated. Shown below are some of the typical roles associated with the educational specifications phase:

Board of Education
- Adopts guiding policies.
- Appoints working committee.
- Approves the official document.
- Authorizes the services of consultants.

Administrator
- Recommends committee personnel.
- Provides leadership, guidance, and assistance to the working committee throughout the study.
- Evaluates the process.
- Interprets the results to the board of education, the staff, and the citizens of the community.

The Working Committee
- Organizes and carries out the study.
- Prepares a written report based upon the findings of the study.
- Reports to the administrator through the chairperson.

Educational Consultant
- Provides guidance, resources materials and planning information.
- Interprets discernible trends and new programs.
- Assists in the editing of the finished document.
- Interprets the finished educational specifications to design professionals.

Architect and Other Consultants
- Acts in the capacity of observers and consultants during the educational specification development.
- Serves as advisors on architectural and site development considerations.
- Provides ideas, alternatives that others react to.

Regulatory Agencies
- Provides guidance, resource materials and procedural guidelines.
- Interprets standards.
- Reviews documents.

The process of development of educational specifications is not a simple task. The more open the participation is to the facility and community the more complex the process. The more people involved, the greater the need to have a carefully organized approach to the process. In fact, as conceptualized in the General Plan for Planning developed by CEFPI and Educational Facilities Laboratories (EFL) in cooperation with the Mott Foundation, it is apparent that the educational specifications can best evolve from a comprehensive task that looks at both community needs and instructional program. This total process is envisioned in the accompanying graphic. It is apparent that the educational specifications are primarily identified in Stage 4. However, those requirements do not exist in vacuum; their

credibility and reliability can best be determined through the process defined in Stages 1-7.

Two important elements are the timing and scope of "educational specification" development. From the discussion on process, it is readily seen that effective planning must be done in proper sequence over an extended period of time. Far too often, decisions are prematurely made regarding the schedule of bond elections, construction, occupancy, etc. It is essential to determine what the program needs are first. The time required to do this may vary from several weeks to several months prior to development of educational program requirements. The process of developing "educational specifications" should commence as soon as the school board has determined that the educational program cannot be adequately housed in existing facilities and has committed itself to move toward a building program — at about the same time as the initial employment of an architect. A facility with a minimum life expectancy of 40-50 years deserves an adequate and careful analysis of the functions to be served by that building. Those functional needs must flow from the educational program needs that in turn flow from the system's mission statement.

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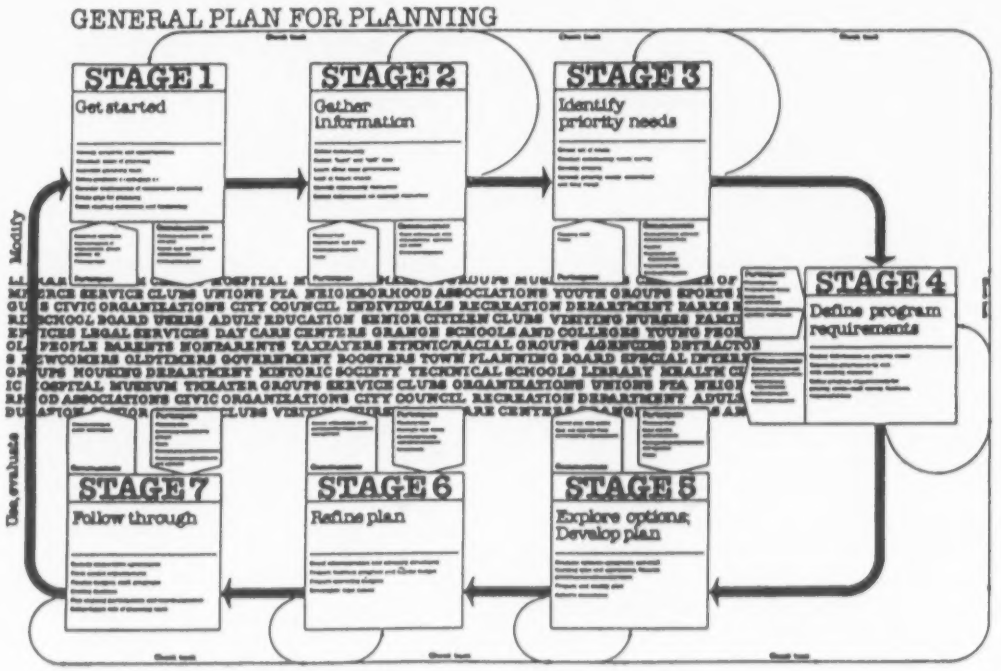


From Community Planning Assistance Kit. CEFP/I and EFL, 1980.
(Graphic reduced)

NOTES:

THE EDUCATIONAL SPECIFICATIONS DOCUMENT

A critical issue in dealing with the identification of program requirements for "educational specifications" development relates to the level of specificity provided by school district personnel. Two basic questions are:
(1) Should the educational specifications be viewed as the teachers' "wish list," or as essentials to accommodate the established educational goals?
(2) Should the educational specifications be expected to reflect *realistic* physical space requirements *and* school district fiscal capabilities? Without a careful understanding and resolution of these questions, the definition of program requirements resulting from the process described above could be an exercise in futility.

The *nature* as well as the *scope* of the document is essential for reasonably accurate communication between owner and architect. Clarification of the level of specificity is possible when all participants subscribe to mutual goals. Additionally, the planning of educational facilities is an activity that must be open enough to foster the expression of ideas with a degree of openness that treats need as a potential "opportunity" to achieve the ultimate in school facilities. Sound professional recognition of need consistent with the best that is known in the field of education is the appropriate starting point. To be satisfied initially with less is the compromise before one begins. Planning should start with brainstorming and move systematically toward a consensus of what is desirable and possible. Workable educational specifications usually result when educators and other participants have successfully related need to realistic capabilities.

Important to the matter of whether educational specifications reflect sound educational *and* facility planning decisions depends on whether all appropriate information is shared with the planning group. If teachers are not given typical physical space guidelines, for example, it should not be surprising that their requests for square footage may exceed that which can be provided. In the same manner, members of the planning group need to know something about costs. This is an important reason to include the architect in this phase of planning. The educators can and should be expected to make the preliminary hard decisions based on realistic economics.

Space requirements (or recommendations) vary state by state. Those responsible for the preliminary planning of facilities will be aided by studying these typical allocations of space for program areas. Given below are a suggested range of base line, physical space allocations derived from a consensus of school planning experts (a committee of CEFPI members).

NOTES:

Net Square Footage

(For conversion of square feet to square meters, the rule of thumb is divide by 10.)

Classroom Areas	Low	Medium	High
Kindergarten	900	1050	1200
Elementary	650	750	900
Secondary	600	700	800

Suggested Area Per Pupil Per Teaching Station

Academic classrooms	Net Square Feet
Mathematics	25-30
Journalism	25-30
English	25-30
Social Studies	25-30

Activity or specialized subject areas

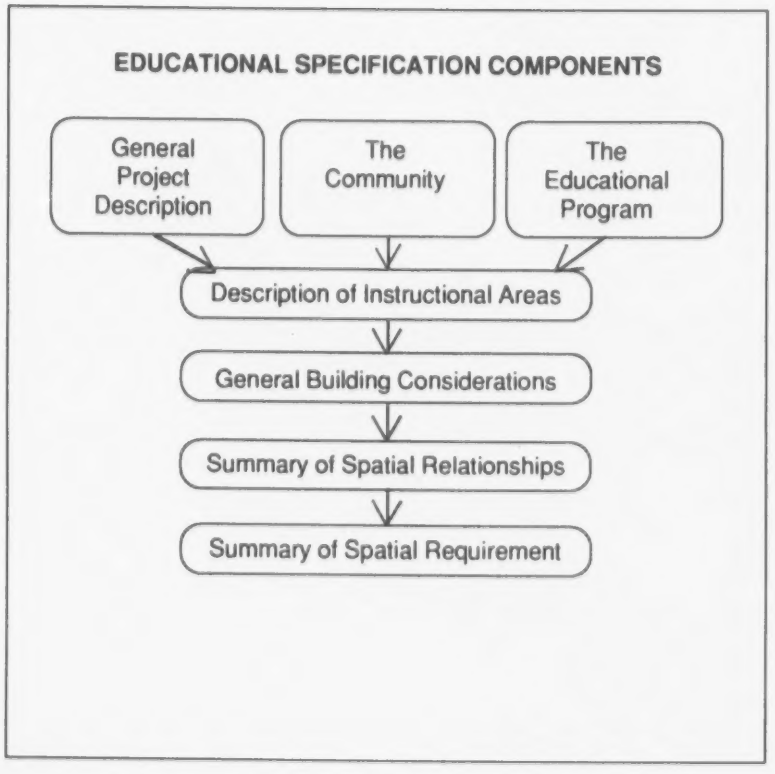
Art	45-50
Commercial	
Bookkeeping	25-35
Business Law	25-30
Related Business Education	25-30
Typing	35-40
Crafts	45-50
Industrial Arts	
Shop (min. 1800 sq. ft.	100-110
Mechanical Drawing	35-40
Language Laboratory	45-50
Library	Elementary Minimum Total - 900 Secondary Minimum Total - 1200 Seating Minimum - 15% Increase by 30 sq. ft. per seated student as enrollment requires
Cafeteria	
Kitchen	2 sq. ft. per meal served
Serving area	0.5 - 0.8 sq. ft. per capacity of the dining area
Dining area	10-14 per seated student
Music	
Band (min. 2000 sq. ft.)	40-50
Choir	30-35
Physical Education	
Dressing rooms	50-60
Health classrooms	25-30
Science Laboratory	45-50
Special Education	35-45
Vocational	
Agriculture	
Shop (min. 1800 sq. ft.)	100-110
Classroom	25-30
Automechanics Shop (min. 2500 sq. ft.)	150
Cosmetology Laboratory	90
Distributive Education	30-40
Homemaking	
Clothing	40-50
Foods	40-50
Industrial Cooperative Training	25-30
Auditorium	
Audience space	10-12 per seated capacity
Stage and total auxiliary space	3750-4800

NOTES:

The square footage established for any program space should be justified by program functions, activities, and numbers to be served in the space.

COMPONENTS OF EDUCATIONAL SPECIFICATIONS

Planning groups responsible for defining the program requirements need to know the general scope of the document. There is little disagreement among planners regarding the major categories of information needed; the degree of specificity needed, however, does cause some variance of opinion. The general components are reflected in this graphic and described in the following narrative:



General Project Description.
The project should be described in terms of: educational level; whether it is an addition to an existing structure or a totally new building; the total number of students to be served; and its general location. Available budget is also an important consideration but usually cannot be established until construction has been more completely described.

The Community.
A brief historical background as well as current factual information should be provided. Maps of school districts and attendance areas are helpful. A site drawing and information about the general characteristics of the site are desirable, if known. The relationship of the proposed building to others in the system strengthens the overall rationale for the new school. This exercise (the planning of educational specifications) serves to remind all involved with the plans that the proposed facility is part of a system.

The Educational Program.
This section communicates the general nature of the instructional program. Grade organization for the district and for this specific campus need to be presented. The district's educational philosophy simply and clearly stated provides the "why" for the project. If that philosophy, for example, included a non-graded structure, it would influence the facility plan.

Descriptions of Instructional Areas
This section describes precisely each element, and the number of each element needed. A typical element might be a student work station or the typical classroom. For the senior high school (and the departmentalized middle school) the classrooms are usually identified by subject areas. It also will be made apparent in this section whether academic classrooms will be a standard size or whether rooms for large and small groups will be accommodated in various spaces. Some districts limit class size and existing policy will be a factor that needs explana-

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tion. Since pedagogy changes with technology, economy and other factors, flexibility must be considered in the language of this section.

Each elementary level and/or departmentalized subject area should be described using these categories of information:

- The Learning Activities
- Materials & Equipment to be Stored
- Nature, Size, and Number of Groups
- Student Projects
- How Subject Matter Will Be Taught
- Lighting & Power Needs
- Spatial Relationships
- Communication Needs
- Needed Spaces
- Needed Furniture & Equipment

Note that the emphasis here is on the instructional delivery system, the "How" of education. The numbers of students to be served and the methodology used in the educational program must be described in physical terms with dimensions and orientation. It is at this point in the preparation of educational specifications that square footage and costs can become more accurately estimated. As mentioned earlier the user educators can make more realistic decisions, if appropriate guidelines have been made available to them.

General Building Considerations

This portion of the educational specifications serves two considerations: (1) Provision for appropriate information concerning non-instructional areas, and (2) Reference to physical characteristics of the building that relate generally to the total facility. The initial consideration permits the identification of square footage not previously determined that can be included in a summary of needed areas.

Non-instructional areas include support spaces, such as restrooms; food preparation and serving (cafeteria); administrative space; specific storage needs, e.g. book storage; staff work areas and student commons. The amount of detail provided here must be specific, but will be guided as much by existing construction standards as by educational methods, space requirements. Approximations of square footage are essential to determine overall footage and estimated costs. General characteristics of elements should be clarified, e.g., lighting, heating, ventilation, air conditioning, floor covering, storage, relationship of the space with instructional areas.

The second consideration addresses essential building features that do not relate to specified square footage. The physical characteristics addressed here are those that are generalized to the building or site and for which there is an educational relevance that should be communicated to the architect. With that criterion in mind the following needs should be described:

- Health and Safety
- Communication Systems
- Flexibility
- Bus Loading Areas
- Student Traffic Flow
- Number of Buses
- Parent Pickup Areas
- Covered Walkways
- Vehicular Traffic Flow
- Type of Acoustical Control
- Community Use
- Floor Covering
- Building Security
- Degree of Open Design Storage Control for Teachers
- Ventilation & Temperature Control
- Site Development for Instruction
- Types of Restrooms
- Display
- Student Lockers
- Standardization of Building Components

NOTES:

Summary of Space Relationships

Although the above described information will be found in various sections of the "educational specifications", there is a need to bring such information together in summary format. Educators should provide a complete description of education needs, not a proposed building layout. Architects provide the expertise needed to develop a layout and design. However, where educational considerations are relevant to a specific spatial relationship, the educational specifications should address that need.

The following table presents guidelines for space relationships based on educational considerations:

EDUCATIONAL FACILITY SPACE RELATIONSHIPS

Space	*Near to*	*Isolated from*
1. Administration	Main Entrance Health Suite	Teacher's Workroom Music Shops Gymnasium Athletics
2. Art	Industrial Arts Photography	- - - - - - - - - -
3. Athletic Fields	Gymnasium Parking Lots Street Access	Academic Classrooms
4. Auditorum	Street Access Parking Lots 2nd Major Entrance Music	Gymnasium
5. Book Storage	Administration Academic Classrooms	General Storage Custodial Storage
6. Cafeteria	Major Entrance Academic Classrooms Storage and Receiving	- - - - - - - - - -
7. Classrooms	Central Area Library	Music Shops
8. Commercial Program	Administration	Academic Classrooms
9. Commons (student)	Main Entrance Administration Library Academic Classrooms Rear and Side Entrances Cafeteria Auditorium	Shops
10. Custocial Workroom	Utilities Storage	Classrooms
11. Custocian Storage (decentralized)	Storage & Receiving	Food Services Main Entrance
12. Conference Rooms	Administration Guidance Teachers' Lounge Academic Clusters	Laboratories Shops Music Cafeteria
13. Driveways	Administration Main Entrance Storage and Receiving Music Auditorium Cafeteria Athletic Fields	Play Areas

NOTES:

Space	*Near to*	*Isolated from*
14. Guidance	Administration Main Entrance	Direct Access to Administration
15. Health Services	Administration Main Entrance	Guidance
16. Homemaking	Art Student Commons	Food Services Gymnasium
17. Industrial Arts	Art	Vocational Shops Auditorium Music Administration
18. Kindergarten	Separate Play Area Driveway Restrooms Storage Cafeteria	Other Classrooms
19. Kitchen (Cafeteria)	Storage and Receiving	Auditorium Gymnasium
20. Library	Academic Classrooms Exterior Entrance	Shops Music Auditorium Gymnasium
21. Music	Auditorium Art Homemaking	Academic Classrooms Administration
22. Main Entrance	Access Streets Parking Administration	Storage and Receiving Shops
23. Parking	Maintenance Auditorium Gymnasium Athletic Fields	Playgrounds
24. Restrooms	Classrooms Playgrounds Public Areas	- - - - - - - - -
25. Science	Labs Growing Areas Nature Walks	Food Service Commons Library Auditorium
26. Service (utilities)	Access Drives Storage and Receiving	All Instructional Areas Play Grounds
27. Shops (vocational)	Storage and Receiving Athletic Areas Agricultural Land	Academic Areas Other Buildings
28. Storage	All Instructional Non-Instructional Service	Main Entrance
29. Teachers' Lounge	Related Instruction Work Area	Administration Guidance

NOTES:

Summary of Spatial Requirements
This summary is the "bottom line" for the educational specifications. The summary should include the total net square footage for all the instructional areas as well as those identified non-instructional areas. The net square footage total needs to be adjusted by a percentage factor to estimate a total gross square footage for the building since the building must include corridors, group toilets, exterior walls and partition width, elevator and stairwell areas, foyers at entrance doors, electrical/mechanical and utility shafts, and electrical/mechanical rooms, the overall square footage will exceed that indicated in the basic sections of the educational specifications. For this calculation, the rule of thumb is to increase the net square footage by 20-40% depending on the building design and the specificity given to the net square footage determinations.

The architect should provide an estimated range of square footage costs for construction so that the educational specifications can be analyzed in terms of cost reasonableness.

The finalized educational specifications must be reviewed and accepted by the board of education for use by the architect. The document then becomes the "written communication" that enables the architect to engage in the schematic design phase of educational facility planning.

REVIEW

It is appropriate for those responsible for the development of the educational specifications to review the architect's schematic design using the educational specifications as a guide. At this state it is essential to make changes before the architect goes into the final design process. If the architect has been part of the planning team, changes are usually minimal.

THE SITE

NOTES:

THE SITE

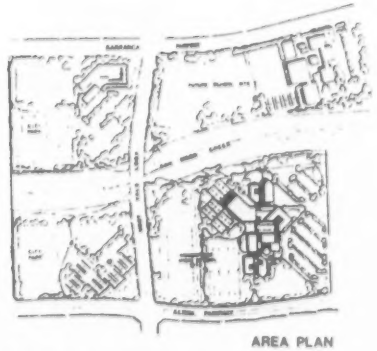
The subject of "the site" involves locating a place to accommodate a particular program or function. While "the site" has traditionally pertained to land only, it also may include facilities.

Intelligent and imaginative site selection and development are significant aspects of educational facility planning, whether in locating a single building or a college campus. The site affects the educational program, cost, transportation needs, enrollment, landscaping, and numerous other factors including the value and land use characteristics of the surrounding area. Because the design and use of the land on which a facility is located is as important as the facility itself, the site's potential as an educational and community resource should be understood and used.

Like other aspects of educational facility planning, site selection increases in complexity as its implications are more fully realized. Possibilities for site development have assumed a new dimension. Planners who have traditionally attempted to locate educational facilities on accessible, beautiful, well-drained land have had to enlarge their perspectives to accommodate some immediate social, political, ecological, economic, and educational issues. The advent of environmental education, the importance of racially balanced enrollment, the imperative for conscientious energy use, the high cost and scarcity of urban land, and the desire for extended community use of educational facilities are conditions that site planners must now consider. This unit examines a variety of site selection considerations and explores general aspects of site planning. It focuses on the site selection process by identifying who does it and when, and what resources are available. It identifies site selection criteria.

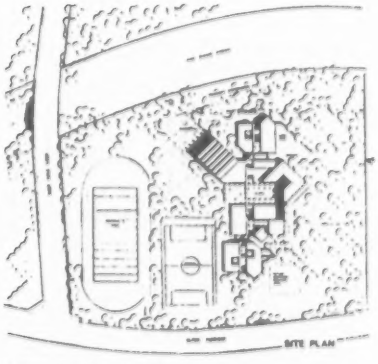
This unit also considers how land is obtained and how it can be used to full advantage.

PERKINS & WILL AREA PLAN



Woodbridge High School Irvine CA

PERKINS & WILL SITE PLAN



Woodbridge High School Irvine CA

THE SITE SELECTION PROCESS

What is to be done? The selection of a suitable site is one of the first steps in attaining the goals outlined in an educational specification. The siting process begins with a definition of important site factors and proceeds to a search for suitable sites, and selection and acquisition of the best site. It concludes with the preparation of a site development plan.

What is the procedure? Typically, a selection team is assembled and directed by the educational administrator. A list of site requirements is prepared based on information about the projected facility and program needs; other basic information may be contributed by cooperating or regulatory agencies and organizations. As potential sites are examined and the choice of acceptable sites narrows to the most promising two or three, some testing or inspection by licensed professionals may be required. The owner normally pays for these services if they are required. After evaluating these results, the selection team recommends a site(s) to the appropriate governing board. The board may then authorize purchase of the land on which the new facility will be constructed or approve the selected site if it is already owned. Depending on laws, the electorate may be asked to approve appropriation of funds for purchase.

When should site be considered? During the 1950s and early '60s when steady growth was common in many educational institutions, it was considered advisable to choose and purchase sites based on projected need. Such foresight could insure the availability of land in proper quantities in desired locations. It was also advantageous economically because early purchase could avoid escalating costs. Contemporary low-growth enrollment conditions and projections usually do not require this anticipatory approach to site selection and acquisition. Responding to rapid growth is not a current challenge in most administra-

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Site Selection

tive units, therefore, sites can be selected and purchased as necessary and in terms of known or projected needs. A more astute site selection can normally be made under these conditions because educational specifications will already have been developed. The planners know who will be served by the facility and the site and how the land will be used. The procedure is obviously more reliable than one based on assumptions about the future.

Who does it? The selection of a site and the formulation of general plans for its development require a well-coordinated team effort by informed persons. Educational administrative official(s), the architect, the educational consultant and department of education officials are often the primary decision makers. They should use the assistance of landscape architects, urban and regional planners, engineers, recreational experts and legal consultants. Persons involved in site selection for educational facilities should have a thorough understanding of program needs outlined in the educational specifications; they must recognize and consider all factors affecting the site. They are responsible for making decisions regarding site criteria, specifically (a) What will be its use? (b) Where should the site be? (c) How large should it be? (d) What characteristics should it possess? and (e) Does it meet development rules and regulations? Team members should understand site development possibilities and appreciate the importance of a well-chosen, fully-utilized site. The main objective of their work is to obtain and develop an optimum site.

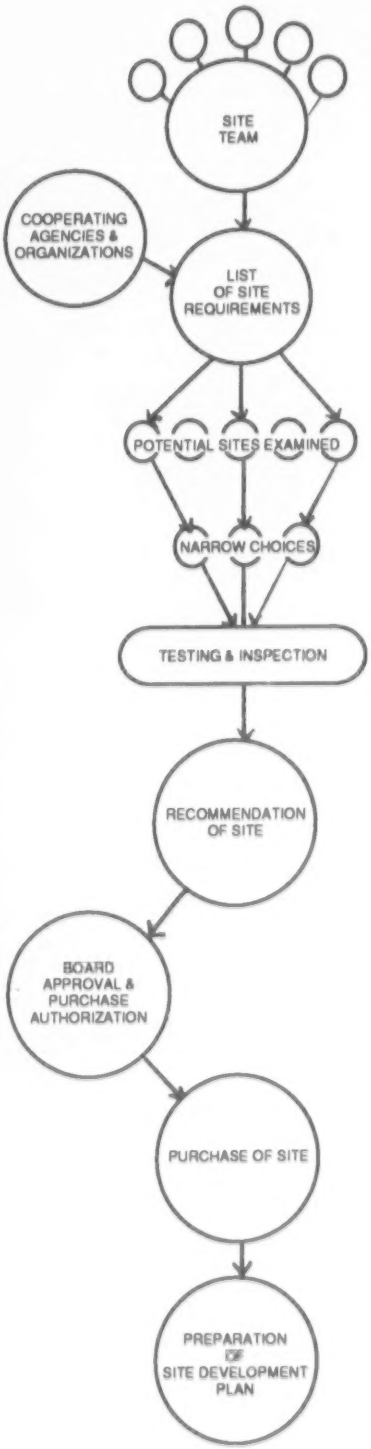
Who does what? Each member of the site selection team will have a particular role to play and special expertise to contribute to the process. How each professional can facilitate the site planning process is briefly outlined below. Those who can assist in an advisory capacity are also mentioned. Some job descriptions given here are not the exclusive domain of any profession, particularly in the cases of the civil engineer and landscape architect.

The *architect* can determine which site characteristics will best accommodate the building design suggested by the educational specifications. He or she also can provide valuable information about the suitability of various sites. The architect can produce preliminary sketches indicating how buildings can be located on the proposed site, thus bringing out good and undesirable site features.

The *civil engineer* makes a boundary and contour map of the site. The map is particularly important if the site is irregular and of questionable suitability. The contour map provides insight into building placement and site development.

The *landscape architect* performs both analytical and design functions. He or she can assist in placing the building on the site for the optimal development of the total area and can provide information on topography, soil quality, drainage, and development potential including energy conservation considerations. The landscape architect may prepare an inventory of all pertinent site features. During later planning stages — after the site has been officially designated or acquired — this person can be involved in designing roadway and parking systems, locating walkways, athletic fields, play areas, and outdoor learning areas, determining appropriate plantings, and planning land contour.

A *testing laboratory engineer* can determine if soil conditions will support planned construction. For instance, if the site features a slide area, water seepage, or similar problems, the testing laboratory engineer can assess the load-bearing capacity of the soil and can specify necessary compensations. The costs of extensive testing should be avoided until plans have been developed to locate the building(s). If sewers are nonexistent, the engineer can determine if the soil will permit the percolation of



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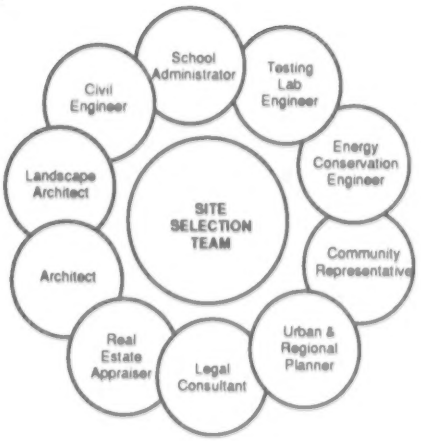
water so that a sewage disposal system can be established.

A *real estate appraiser* can judge if the cost of a site is reasonable. He or she may conduct a study that will include photographing the site and comparable real estate, determining prices of other property recently sold in the area, and ascertaining alternative land uses. A real estate appraisal is particularly important when an educational institution initiates condemnation proceedings in an attempt to acquire a site. When the right of eminent domain is exercised, the appraiser submits evidence on property value to the court. The court then rules on a purchase price that is fair to both owner and buyer.



A *legal consultant* should examine all legal documents and advise the governing board and officials on legitimate procedures for property acquisition, whether by purchase, gift or condemnation.

Urban and regional planners are experienced in the use of techniques for analyzing and mapping areas to help locate sites. Their tools include soil maps, aerial photographs, topography maps and highway maps. They can advise on zoning regulations and highway construction.

An *energy conservation engineer* can propose ways to minimize energy consumption in both siting and building the project.

In some cases a *community representative* may be included on the site selection team to convey the concerns and desires of the local community.

What resources are available?

The facilities master plan and the educational specifications documents described in earlier units contain essential information about the people, program, and building for which the site will be used. The skills and knowledge of the site selection team and its advisors are additional resources. The following sources also can help in the site selection.

Comprehensive regional, urban or community plans will show intended land use. These are reliable only if adopted and if adjusted to changing conditions and rates of growth. Most communities, local governments or regions maintaining full-time professional planners will have developed such documents. In larger areas, a full-time planner may be assigned to assist educational institutions in locating sites and developing long-range plans. The planner will provide information on existing land use, community facilities needs, transportation, zoning ordinances and demographic data.

Aerial photographs and photomaps help identify available lands for school sites. They also detail land improvements. Photographs may be available in stereopairs, which can create a three-dimensional image of land characteristics. Aerial photomaps are generally useful and more economical because of the printing process. They lack the definition of a photograph, but they are adequate for identification purposes. Photomaps may be obtained at cost or any be borrowed from a local planning office. Recent photographs should be obtained because updating and cross-checking old ones against land ownership changes and building permits is time consuming.

Topographical maps can often be obtained from an appropriate government agency (e.g., the U.S. Coast and Geodetic Survey). In rapidly growing areas it is possible to obtain maps made from recent aerial photographs; however, they are occasionally general and inaccurate. In some instances, preliminary working prints (blue line) can be obtained from regional offices. Published topographical maps that are color-coded and keyed to a legend of standard symbols are generally at least three years old; the best available are the 7 1/2 minute maps at a scale of 1:24,000. State index maps are also

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available that show quadrangles by name, date published and scale. A check with local engineering offices, both public and private, may reveal the existence of appropriate topographical maps and legal descriptions of land under investigation. As site choices are narrowed, these topographical maps may be enlarged and logical contours plotted at more frequent intervals so that the architects can prepare schematics on site development.

Highway maps can be obtained from the district engineering office of the state or provincial highway division. City and county engineering offices are other sources of local maps and plans useful in analyzing vehicular and pedestrian routes.

Property ownership maps are located in city or other local government recorder's offices or are filed with the registrar of deeds. These documents name current owners and provide legal descriptions of property, including deed restrictions, covenants, and conveyances, easements, rights of way, sight line and building height restrictions, and reversionary clauses.

Information about physical characteristics is usually available through official and unofficial sources. Maps and diagrams showing the soil classifications, sub-surface characteristics (geological formations), rift zones (earthquake faults), flood plains and control measures, and weather data should be examined when available.

Urban development data provide house counts, empty lot counts, and information about utility lines, telephone connections, real estate transactions and building permits. To test enforcement of zoning and assess the possibility of undesirable encroachment near a potential site, granted zoning variance requests should be examined.

Federal agencies maintain records on the location of airports, waterways, parks, recreational areas, wilderness areas and agricultural areas, and on transportation plans, labor statistics, census data, health and welfare services, and urban development. Most of these services and concerns are handled by agency offices at regional, state or provincial levels.

Public safety officials, including fire departments, police and the nearest Civil Defense office, should be contacted to ascertain how a potential site fits into the community's disaster and emergency relief program.

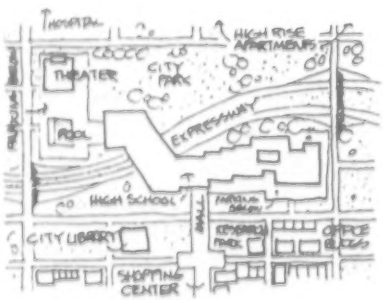
The Environmental Protection Agency can provide information on the environmental impact of the project.

Other sites, either in use or abandoned, should be considered. It is possible that an educational program may be best accommodated on an already-developed site.

CRITERIA FOR SITE SELECTION

Each parcel of land identified as a potential site should be thoroughly examined to determine its suitability in terms of educational plan, accessibility, cost, size and numerous other criteria. Those responsible for site selection must investigate both present and possible characteristics of the site and the surrounding property. The resources mentioned above should be used in an attempt to answer at least the following questions:

- Will the site support the educational program?
- Is the site's location convenient for the majority of students?
- Is the site the right size and shape?
- Is the topography conducive to desired site development?
- Is the general environment aesthetically pleasing?
- Is the site safe?
- Is the air quality healthful?
- Is the site free of industrial and traffic noise (both air and ground)?
- Does the land drain properly and are other soil conditions good?
- Does the site have desired trees and other natural vegetation?



MASTER PLAN
URBAN SCHOOL SITE

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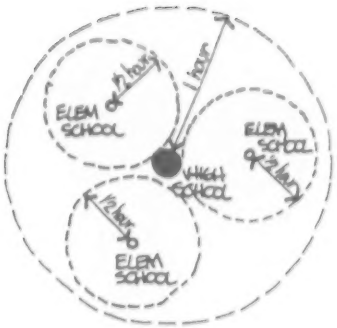
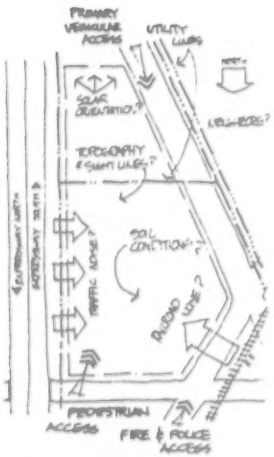


MAXIMUM
TRAVEL TIME
FOR TRANSPORTED STUDENTS



SITE FEASIBILITY
CONSIDERATIONS

- Is water available?
- Are there easements of any nature affecting the use of the site?
- Is the site suitably oriented for energy conservation?
- Is the site located on a flood plain?
- Is the site near other community services—libraries, parks, museums?
- What is the relation of the site to existing educational facilities?
- How is surrounding land zoned—will its development enhance the site?
- Are utility services available?
- Is the site served by public agencies—police, fire department, etc.?
- Is the site easily accessible for service vehicles?
- Can the land be shared with other community facilities and organizations, especially parks?
- Will the site provide desirable open space for the community where it is needed?
- Is the site available?
- Is the site expandable in the future?
- Is the site affordable?
- Are life-cycle costs reasonable?

It may not be possible to locate a site that will totally accommodate all needs. Compromise may be unavoidable where land is at a premium and choices are limited. For instance, no urban facility planner will reject a potential site because it does not offer pleasant vistas and an absence of traffic noise. Criteria must be adjusted to existing conditions and constraints. Nevertheless, the selection committee should discuss priorities and agree on what qualities are indispensable. Site deficiencies should be examined in advance so they are not a surprise after purchase, or worse, an obstacle to planned development.

Informed site selection may therefore consume much time and will require research, assessment of values, and some major choices. It probably will not be an easy process. Some additional considerations related to criteria for site selection are presented below.

Program considerations. Perhaps the most crucial question the site selection team must ask is this: will the potential site allow realization of the educational plan? All other questions are secondary to this issue. The educational specifications should be examined and their recommendations applied to each potential site in an effort to assess the compatibility of the site and its projected use. One method for determining how successfully a site responds to space needs is to make a trial layout. Information on educational policies, curriculum, type of educational institution, anticipated community use, and projected enrollment figures are necessary for such a study.

Centrality/accessibility. Sites for educational facilities should be located as near as possible to existing and proposed community facilities, including parks, recreational centers, galleries, libraries and health centers for easy access to these resources. If adequate land is available, sites should be located near the center of the probable future student population. Centrality of a site may be erroneously sacrificed for less costly or more desirable land that is remotely located. Planners should not lose sight of the fact that transportation of students is costly. (Good accessibility is therefore good energy conservation.) If busing is necessary, the site should be accessible from feeder streets and roads to simplify the safe loading and unloading of transported students.

Whenever possible, it is desirable to locate facilities within walking distance of the greatest number of students. These distances are considered reasonable maximums for pupils walking to school: three-fourths of a mile for elementary school students, and one and one-half miles for middle school, junior high and senior high school students. These travel times on conveyances are considered reasonable maximums for transported pupils: one-half hour for elementary students and one hour for secondary students. In some sparsely populated

localities, longer travel times are considered reasonable. School size (and, therefore, site size and number of sites) determines accessibility. Small schools are more accessible.

Relation to other educational facilities. If population growth or spread is anticipated, sites should be selected to avoid undue overlapping of areas to be served by different schools or institutions. In attempting to determine the geographic boundaries of areas, at least six factors should be examined: (1) the student group to be served by each institution, (2) the permissible type of residential development because type of dwelling may affect enrollment, (3) transportation policy, (4) hazards and natural barriers affecting accessibility, (5) policy regarding maximum school or institution enrollments, and (6) racial characteristics of population to insure integrated enrollments.

Topography. It is desirable to select land with a slightly convex surface that is moderately elevated above the surrounding ground. Such characteristics can insure natural drainage and save the added expenses of grading and filling. If possible, land should slope toward the south to allow maximum use of passive solar energy measures. Test boring of a proposed site to determine its suitability to support buildings is always recommended. Surfaces and subsoil that have been filled with debris are generally unstable; a site of this type may require deep and expensive footings or piles. The effect of topography on sight lines also may be considered.

Availability of utilities. A site should be located so that gas, water, sewers, electric power and other utilities can be provided at reasonable costs. The availability of utility services for a proposed site should be investigated before purchase because location can make an appreciable difference in the cost of connections. The expense of installing extensive runs of piping and wiring or of establishing a sewage disposal system could be prohibitive.

Availability of other services. Police and fire protection should be considered as well as the availability of garbage disposal service.

Zoning. Community zoning and future development plans deserve study before a site is purchased. Locations where future zoning might permit construction of factories, congested business centers, and noisy, hazardous transportation systems should be avoided. Cooperative planning with other agencies is vital to insure that such encroachment does not occur.

Size of the site. The initial site purchase should meet all the site size requirements because land adjacent to a new educational facility may not be available later. Site size should be determined largely by the nature and scope of the contemplated educational program. The following standards have been useful to many planners (though it is not always possible to meet these standards, they may be helpful where land is available):

1. For elementary schools, it is suggested that a minimum site of 10 acres be provided, plus an additional acre for each 100 pupils in the projected maximum enrollment. Therefore, an appropriate site size for an elementary school with 200 pupils would be 12 acres.

2. For middle schools and junior high schools, it is suggested that a minimum site of 20 acres be provided, plus an additional acre for each 100 pupils in the projected maximum enrollment. Thus a site of minimum size for a middle or junior high school is 500 pupils would be 25 acres.

3. For senior high schools, it is suggested that a minimum site of 30 acres be provided, plus an additional acre for each 100 pupils in the projected maximum enrollment. Thus a site of minimum size for a senior high school of 1,000 pupils would be 40 acres.

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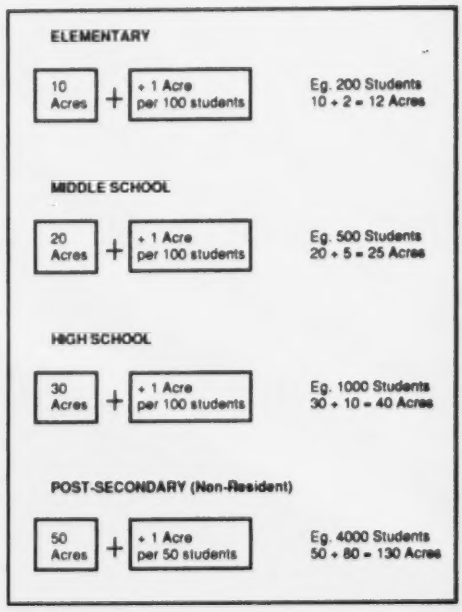

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4. For higher education (post-secondary) purposes a site of 50 acres plus one acre for each 50 students is desirable for a campus with no residential facilities and in an area where land is readily available. In a restricted or more urban setting this desirable goal must clearly be altered.

These standards apply to the suburban site. In an urban neighborhood the site also will be urban in scale and attitude. Instead of large lawns, courts and gardens, multi-floor buildings will somewhat reduce land needs. In these cases the dual use of land is a key factor.

Cost. In determining the reasonableness of the cost of a proposed site, many factors must be considered. Initial cost is only one part of the ultimate expense. A site may be costly initially but economical in the long run. Conversely, an inexpensive property may be expensive to develop. All factors related to both initial and long-range costs must be considered.

Disadvantages of poor site selection. Failure to address a complete list of site selection criteria can result in selection of a poor site. Poor sites may have several disadvantages: inability to meet all the educational program requirements, higher than expected operating costs, inability to accommodate future expansion, susceptibility to change (for example, a planned highway may interfere with an otherwise satisfactory site). Careful planning will help avoid these types of pitfalls.

SITE ACQUISITION

After all potential sites have been examined in terms of the criteria agreed upon by the decision-makers, a well-informed selection can be made. The chosen site may be acquired by one of five legal methods: (1) purchase from the owner, (2) acceptance as a gift from the owner, (3) condemnation of private property (with purchase at fair market value), (4) receipt of surplus government property, or (5) lease of government-owned property.

Outright purchase of property from the owner is usually the most satisfactory method of land acquisition. In most instances, governing boards are authorized to buy land for sites. Occasionally a site purchase must be approved by the electorate. Approval of site purchase by state or provincial agencies is often mandatory.

Local citizens or firms may offer to donate land for a school site. If this is the case, several precautions should be taken before acceptance. The governing board should be certain it will have clear, unconditional title to the land and that there is no reversion clause. Also, the suitability of the free site should be judged by the same standards applied to other sites. If the site does not meet specified requirements, the cost of developing the land to the desired condition should be considered.

Condemnation is common in many areas but with varying conditions. Exercising the right of eminent domain allows public institutions to acquire land when the owner refuses to sell or when a price cannot be agreed upon. The land is appraised and the court determines a fair purchase price. Administrators and boards should use every reasonable effort to acquire land without court action, but because of the widespread, long-range effects of site selection, condemnation may be a justifiable and necessary site acquisition procedure.

When land owned by a government is declared surplus, it may be available free for sites. In such cases, those responsible for site selection and acquisition should study the suitability of the site in the way they would land donated by any other party. The same applies to sites that are leased from a government.

Laws affecting the securing of proposals for sale, appraisals, counter-

offers and options should be investigated. Every effort should be made to guarantee that site acquisition is clear and legal.

SITE DEVELOPMENT

Guidelines for site development must be flexible enough to accommodate differences in the character of various sites, the types and sizes of facilities to be built, and the nature of the educational program. A well-developed site can assume a variety of forms because it will evolve out of existing natural features and the planned use of the site. Therefore, this section is less concerned with specific recommendations than with procedures and possibilities for site development.

Survey of essential site data. A logical starting point is the preparation of a survey of essential site characteristics. This inventory is analyzed and serves as a basis for the site design. The survey should provide at least the following information:

1. Title of survey, property location, certification, and date
2. Scale and compass orientation
3. Tract boundary lines, courses, and distances
4. Names of abutting property owners
5. Bench mark with assumed elevation
6. Names and locations of all existing road right-of-ways on or near the tract
7. Locations of all existing structures on the site, including buildings, foundations, bridges, wells, cisterns, walls and fences, and rock outcropping
8. Locations, type, size, and flow of all existing storm and sanitary sewers on or contiguous to the tract, including top and invert elevations of all manholes, and inlet and invert elevations of other drainage structures
9. Locations of roads, drives, curbs, gutters, steps, walks, paved areas and the like, indicating types of material or surfacing
10. Locations, type and size of all water and gas mains, meter boxes, hydrants, and other appurtenances
11. Locations of all utility poles, telephone lines, and power lines, with indication of nearest leads either on-site or off-site; pertinent information and ownership of all utilities
12. Locations of all swamps, springs, streams, drainage ditches, lakes, and other bodies of water; line of maximum flood plane if applicable
13. Outline of wooded areas; location of trees and plants, identification of trees with trunks over eight inches in diameter at waist height, and identification of productive and non-productive plants
14. Road elevation for all improved roads on or adjacent to property; improved gutter elevations on property line side at intervals of 50 feet
15. Elevations throughout the site sufficient to develop a complete and thorough contour map
16. Construction of permanent property corners such as concrete monuments (optional).

This survey must be performed by a competent land surveyor who is properly registered. Incomplete or inaccurate information could have disastrous consequences later. Do not underestimate the importance of this survey.

The site development plan. It is now possible to begin developing a land-use plan that details solutions to land

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COMPARING ALTERNATIVE SITES

Each factor weighted on a scale of 1 to 10 for desirability.
Line 1 = Raw Line 2 = Weighted

FACTORS	WT Factor	SITE A	SITE B	SITE C	SITE D
Program Support	5	7 35	7 35	5 25	10 50
Ease of Acquisition	1	9 9	10 10	4 4	6 6
Cost of Site Development	3	10 30	6 18	6 18	9 27
Cost of Utilities	2	3 6	5 10	7 14	10 20
Aesthetic Quality	3	10 30	9 27	4 12	7 21
Location & Centrality to student population	4	3 12	6 24	8 32	9 36
Ease of Future Expansion	5	5 25	7 35	4 20	2 10
Future Land Value and Marketability	2	4 8	6 12	6 12	10 20
Adaptability to Future Grade Organization Change	4	7 28	7 28	7 28	8 32
Cost	4	5 20	8 32	4 16	6 24
TOTAL EVALUATION (weighted scores)		203	231	181	246

(factors weighted from 1 to 5 to describe the importance of the factor to the specific project)

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engineering concerns such as adjustment of grades and placement of parking areas, roads and walkways, landscape design, and plan of outdoor learning and athletic areas. These plans should be prepared concurrent with building construction plans. The procedure outlined below is a practical approach to the task.

1. Obtain a topographical survey of the site.

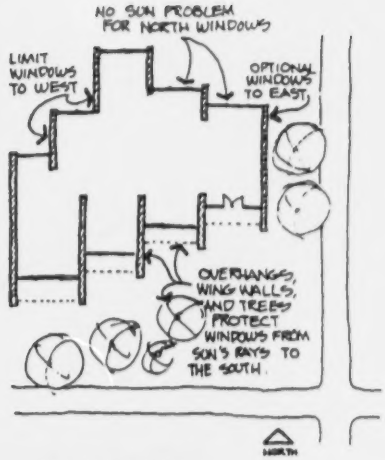
2. Make repeated visits to the site to gain a feeling for its character, to collect information, and to begin a land-use analysis. Usually the architect takes a print of the topographical survey directly to the field. From on-site observations, he marks down all pertinent information that might influence site planning such as views, sculptural land forms, quality of the soil, trees, outcropping and streams.

3. Prepare diagrammatic studies based on all collected information and an understanding of the site. Many diagrammatic studies are needed to explore and evaluate alternatives. They are usually prepared by the architect in rapid freehand sketches, which are seldom shown to the client; yet, these studies are critical for the development of ideas. The architect can benefit by collaboration at this point with the clients, facility planning specialists, landscape architects, engineers, and other experts, who, in a free interchange of ideas, generally contribute such specific information that the best plan concepts evolve spontaneously.

4. Develop a refined site plan. (The architect should not proceed beyond No. 3 until the school buildings are planned in detail.)

Aspects of site development. There is more to proper site development and landscaping than positioning the building on the lot and planting a few immature trees and assorted evergreen shrubs. However, minimal site treatment is not uncommon and it may result from economic constraints, other priorities, or lack of information or imagination. Nevertheless, aesthetic and functional considerations and relationships must be examined, an able landscape architect must be retained, and funds must be allocated for site development in the initial capital outlay budget. The expense of developing an attractive site can be justified by many arguments: it pleases users and observers; it facilitates and encourages use by students, staff and community; it enhances the appearance of the building; it provides opportunities for learning and recreation; it is safe; it is less subject to vandalism than a neglected or barren site; it can facilitate energy conservation, e.g., by the planting of shrubs as windbreaks. Thoughtful and imaginative site development is a way of demonstrating respect for the natural environment; its significance in the educative process should not be ignored. (The same is, of course, true of the building itself.) Because of the importance of site development, attention should be directed to the following site-related matters.

Orientation of the building: The location of the facility on the site should be attractive and should allow for the desired development of athletic fields and recreation and learning areas. It should avoid hazardous entrances on main thoroughfares. Approaches to sites should not require students on foot to cross main traffic arteries or railroad rights of way. If the site borders a highway, the main entrance drives, walkways, bus routes and loading spots should be designed with respect for the safety and convenience of users. Proper orientation is essential for both comfort and energy conservation. Windows should face south (with shielding to exclude high, hot summer sunlight while admitting lower winter sun) or east (since early sun is more acceptable than late afternoon sun) or north (no sun problem).


NO SUN PROBLEM FOR NORTH WINDOWS
LIMIT WINDOWS TO WEST
OPTIONAL WINDOWS TO EAST
OVERHANGS, WING WALLS, AND TREES PROTECT WINDOWS FROM SUN'S RAYS TO THE SOUTH.
NORTH

SUN CONTROL
WITH DESIGN ORIENTATION

Also, orientation with the prevailing breeze is desirable.

Walks: Walks should be designed to handle the volume and type of pedestrian traffic anticipated. Areas bordering walks should be treated in a way that will endure wear. Walkways should provide direct and convenient access to and from the facility; otherwise, the users will create their own paths, which may damage shrubs and grass and create maintenance problems. Walks should not be paved until natural patterns of usage have been established.

Parking: Streets and thoroughfares near sites are for the movement of vehicular traffic, not for its storage. Cars parked parallel to curbing may contribute to traffic congestion. They also may create serious safety problems if students dart into traffic from between them. Off-street parking is considered essential by most authorities and educational facility planners. Adequate parking that is well designed for safe entrance and exit of traffic at peak hours is a key element in the selection of a site. Another major concern is to provide appropriate entrances and landscaping or grading that will avoid an "acres of asphalt-sea of cars" look. Circulation patterns should be analyzed to insure that arrival and departure of students, staff, visitors and service vehicles is separated from bus arrival and departure areas and pedestrian walkways. Safe travel and parking for bicyclists also should be provided.

Lighting: Lighting of the site should promote safety and enhance the appearance and security of the building. Parking areas, pedestrian walkways, entrances and steps should be clearly illuminated.

Grading: Creative, functional grading of the site can improve the appearance of the building and provide screening from noise, wind and other climatic conditions. For example, earth berms, or mounding, along highways can shield the site from traffic noise. Grading to create earth forms for climbing, sliding, and so forth is an inexpensive way to provide good recreational opportunities.

Vegetation: It is advisable to hire a landscape architect (if one is not a part of the architect's team) to plan and supervise the landscaping of the site. Respect for existing vegetation is encouraged; healthy trees growing on the site should be preserved. Later plantings should consist of varieties that are indigenous to the locality and that will respond well to light and soil conditions on the site. Lawns should be seeded or sodded. Trees — both deciduous and evergreen, shade and ornamental — as well as shrubs, flowers and ground covers should be selected and grouped according to height, color, and cultivation and maintenance requirements. Productive trees and shrubs could be given preference over purely ornamental plants, as a way to reintroduce the idea of self-sufficiency and self-reliance in food. Maintenance requirements may be lessened by mulching to reduce watering, weeding and the need for artificial fertilizer.

Vegetation also can discourage land erosion, mark boundaries, provide shade and shelter, channel pedestrian traffic, and provide visual and aural screening. The effectiveness of trees in reducing the amount of fuel used for air-conditioning buildings is an important energy conservation factor. In the summer, deciduous trees located near buildings can shade and cool; when leaves are shed in the autumn and winter, light and warmth are admitted.

Outdoor learning spaces: The site is an immediately accessible learning resource. Soil, water, air, rocks, insects, and plant and animal life on the site can be studied, measured, sampled and experimented with. These features help students to learn about the natural environment and its interrelationship with human beings. Therefore, planners should preserve wetlands, streams, indigenous vegetation,

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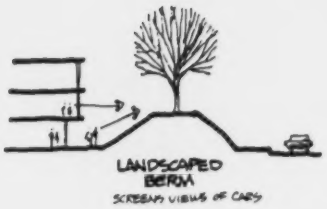

Protects facilities from noise and may be used for the production of fruit and berries as a windbreak or as 'ski' run protection

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rocks and other site features that can be used in the educational program. It may be desirable to set aside land for a productive garden and space for animals in order to provide experiences with self-sufficiency in food (a critical area for the future). Such spaces should be well drained and secure, and should offer shelter and storage.

Outdoor spaces for environmental education are not just a suburban or rural option. Small spaces on city school sites may be usable for growing plants and observing other living things. The city itself is an invaluable resource for learning about the built environment.

Gathering places: Areas where people — students, staff, and community residents — can gather, sit and socialize should be considered in the site development plan. With open school schedules that give students freedom to go outdoors during unscheduled time, gathering places are more important than in the past. If these spaces are comfortable, attractive and sturdy, they will encourage extended use of the school site. Also, spaces that are heavily used and that attend to human needs are less likely to be abused than those that ignore the users' visual and physical comforts.

Play areas for young children: School playgrounds should provide for strenuous physical activity like running, jumping, climbing and swinging. They also should provide opportunities for the development of manipulative skills, for game playing, building and imagining. Outdoor play areas should offer excitement and challenge as well as a chance for mastery. They should be safe and attractive—for children as well as most adults, this means a variety of spaces and natural features like trees, grass and other living things, not an asphalt surface punctuated with a couple of swings, a slide, a jungle gym and a basketball net.

Outdoor play facilities may include both hard and soft surfaces, sand boxes, nature trails, gardens, ponds, hills and rock piles, as well as areas for games and fixed and moving apparatus for physical development. Children should have an opportunity to come into contact with natural and man-made objects that provide a variety of visual and tactile experiences. Many appropriate play items for younger children are inexpensive — some of them may fall into the "junk" category, like old tires, lumber and barrels out of which children can create shelters, lookouts or whatever else is fun at the moment. Adventure playgrounds allow children a chance to cooperatively plan and build their own ever-changing environments; they are a possibility for site development that planners should investigate.

Playground equipment: Playground apparatus and equipment should be carefully selected. Merry-go-rounds, ocean waves, swings and giant slides are of questionable value because they provide little exercise and are often dangerous. The use of rings, horizontal bars, and horizontal ladders affords good exercise for older children. Some schools have effectively used large drain tiles as crawling tubes for small children. Drain tiles provide good exercise but they are hard on clothing if they are not placed a little above the ground and kept clean.

Only equipment of sturdy construction should be selected. It should be erected under the direction of competent persons familiar with its use and the wear and tear to which it will be subjected. All joints and moving parts should be provided with safety guards to prevent pinching and shearing action. Hard surfaces under climbing equipment should be covered with soft, sanitary material to reduce injuries. Ease of supervision, safety, and economical use of space are considerations in locating equipment. Apparatus may be placed to advantage near a school building where the noise created will not be a problem and where it is readily accessible. If revolving or swinging apparatus is used, it should be placed either along a

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fence where there will be little danger of children running into it, or safety railings should be provided. The lines of motion of adjacent pieces of apparatus should be parallel to reduce cross motion. Ample space for safe use should be provided around equipment, but it is advisable to have it grouped so space is not wasted.

Play areas and athletic fields for older persons: Larger outdoor play spaces are often required on sites used by older children and adults. Courts and athletic fields for both informal and organized games should be provided. These may include facilities for softball and baseball, tennis, football, volleyball, archery, track, field hockey, swimming, or any other sport offered by the school's physical education and recreation program. Additional facilities may be developed in cooperation with community groups to encourage and accommodate adult use and participation in lifetime sports.

Intramural, interscholastic and intercollegiate athletics are commonly a part of the total educational program. The type and quality of special facilities for athletic programs will depend on the available funds and on the importance attached to competitive sports by the school's students, staff, parents, alumni and community. However, interschool athletics, football for instance, may require the construction of a stadium and playing field as well as lighting, spectator auto parking, traffic routes that do not interfere with other site development possibilities, facilities for ticket sales and collection, refreshment sales, toilets, a public address system and team rooms.

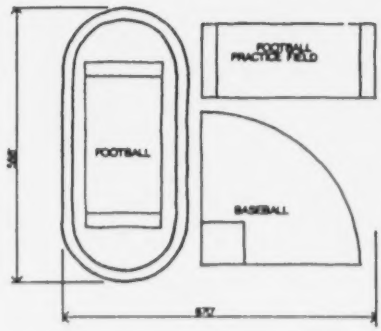
Community use: Possibilities for community use of the site should be thoroughly explored. The wastefulness of limited site use—closing down for evenings and long vacations—is not defensible. The educational facilities and site are community resources and can operate as such without disrupting the educational program.

URBAN SETTINGS

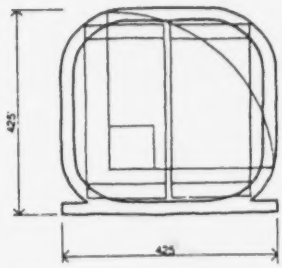
In older cities, acute congestion and high property values make acquisition of sites for both new construction and expansion of existing facilities very costly and complex. Where choices are limited by financial and physical constraints, the need for establishing priorities is vital. Efficient use of space is imperative. Urban facility planners must be especially imaginative and resourceful in the use of available space and existing buildings.

Possibilities for building and site design must be considered that are unnecessary in most suburban and rural areas where expansiveness is taken for granted. For instance, consideration might be given to elevating the educational structure so that recreation areas can be constructed beneath it, constructing a multi-story building with elevators or moving stairs, putting recreation and physical education areas on the roof, building some facilities (such as heating plants, parking and storage areas) underground or locating them remotely, or placing parking beneath stadia or other buildings that have a high degree of community use. Regarding playing fields and outdoor instructional areas, it may be possible to: (1) plan for multi-use of the same area at different times of the day or during different seasons, such as having football practice fields, baseball practice fields, or areas for unorganized recreation in the same space; (2) stagger recreational periods so that only a portion of the student body would be on the playing fields at any one time; (3) construct the building adjacent to a public park or playground that could be periodically used for recreational purposes; (4) provide fields for athletic practice and games in an outlying area where land is less expensive.

In urban areas, the advantages of community use are obvious. Because of their proximity, the educational facility and neighborhood are intimately related. In developing its site,



CONVENTIONAL TRACK & FIELD LAYOUT
9.05 ACRES



PROPOSED TRACK LAYOUT
4.14 ACRES

Compared to 9.05 acres required for conventional layout this represents a savings of 4.91 acres.

Based on $2/sq. ft. (min. price for urban land) this saves at least $425,000.

Diagram courtesy Gassner Nathan Browne, Architects

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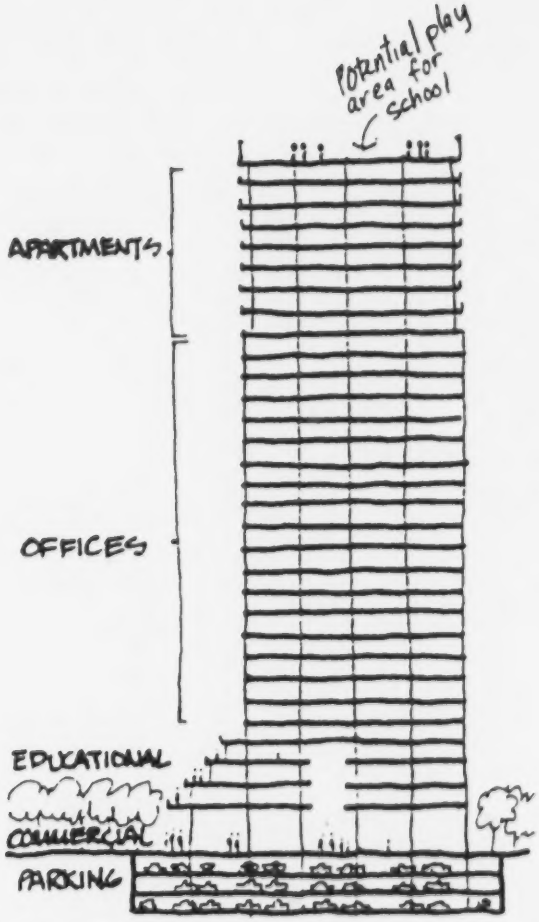

JOINT OCCUPANCY

the institution should not attempt to isolate itself and shut out the community. Furthermore, it need not confine its program and activities to owned real estate and neglect educational opportunities within the neighborhood. Determining community needs, developing a site that is responsive to those needs, and exploring possibilities that cannot be provided on the immediate school site are important concerns for the urban facility planner.

JOINT OCCUPANCY

For sites confronted by economic problems and/or the inability to expand physically to accommodate programs and students, joint occupancy offers a viable alternative. Joint occupancy or mixed use could mean the educational program shares a building with other programs or occupies a building on a site that is shared with other programs. Schools have successfully entered into joint occupancy situations with commercial, housing, civic and recreational operations. They have shared space with health services, parking lots and business offices. Mixed use of urban sites in particular can save money. In cases where the educational institution owns and leases the developed property, joint occupancy can support the institution. It responds to the need for conserving space, which is inescapable in cities, and it helps to integrate the educational institution and community. Joint occupancy requires legal arrangements and collaborative planning (which is more complex than working out site problems related to the educational facility alone).

UNIT G • SPACES FOR LEARNING

SPACES FOR LEARNING

Prepared by:

Dr. Harold Hawkins
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SPACES FOR LEARNING

The school environment affects attitudes and it affects behaviors. The character, appearance, and physical arrangement of the learning environment convey distinct messages to the users about the activities and responses that are expected and appropriate. The environment also operates in a practical way to enhance or interfere with the operation of the educational program. An obvious example of the interrelationship of learning environments, the educational program, and the users can be found in the different approaches to providing instructional spaces.

Learning spaces today tend to feature separate learning centers for the exploration of science, math, social studies, reading, painting, and so on. Spaces for large group gatherings, tables for small group work, and nooks for individual activity may be provided. Variety, informality, movement, and the availability of learning resources are other characteristics. A traditional classroom in which desks are provided for students and arranged in rows facing the teacher's desk has a different function: the traditional arrangement facilitates student listening and sedentary work; the teacher is the focus of attention and can direct and supervise student work with ease. More open arrangements facilitate student activity, exploration and interaction.

The purpose of this Unit is to provide guidelines for persons planning spaces for learning. The Unit presents information about general learning spaces, those that serve the academic areas of the curriculum including library media centers and spaces for programs with special requirements such as fine arts, science, physical education. The Unit includes requirements for the education of exceptional students and young children. Discussion of learning spaces is limited to indoor facilities. For information about outdoor learning spaces, see the "Site Development" section of Unit F.

Because each educational program has unique facility requirements, it should be recognized that this Unit cannot provide complete or universally applicable information about learning spaces. It does attempt, however, to promote an awareness of possible facility needs and physical solutions to some basic and obvious program requirements. For all program areas it is highly essential to have staff participation in the planning for each of the specific programs.

GENERAL CONSIDERATIONS

Classrooms, regardless of design, should support the educational program in a practical way by providing the space and the types and quantities of equipment needed. Classrooms should provide the required thermal and acoustical environments and be properly illuminated. The space should effectively contain the types of learning activities planned and yet be versatile enough to accommodate other learning situations if necessary.

Before learning spaces can be planned effectively, the program of planned learning activities and educational objectives should be examined. Each type of learning activity imposes different demands on learning spaces. For example, learning spaces in which teacher directed experiences are predominant should be designed to permit the students' visual and auditory contact with the teacher.

Spaces for group interaction should be arranged to facilitate an exchange of ideas and allow individuals to confront other members of the interaction group. Group activities should not have to compete with outside interference. Access to needed equipment and materials such as chalkboards should be provided. Where independent, self-directed student work is to be accommodated, spaces for individual work, reading, analysis, collection of information and writing — all which require some degree of quiet and solitude — should be planned. Spaces for experimental, learning by doing pro-

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grams geared to both individuals and groups require specialized equipment and furnishings. The safety of students and provisions of special environment effects are important considerations.

The planning process is essentially the same for all types of educational environments. It involves identifying the users, describing the learning activities and their desired outcomes, defining the relationships of one learning space to others, describing needed equipment and furnishings, and specifying special environmental considerations. This process is fully detailed in Unit E.

GENERAL LEARNING SPACES

The information provided here relates to learning spaces that serve large segments of the student population. The students served in general learning areas may be at either the elementary or secondary levels. The program context is not limited to a specific content field or single activity.

ELEMENTARY SCHOOLS

In elementary schools, there is generally a heavy emphasis on small group and individual learning in addition to large group activities. General learning areas for 20-25 students may support a variety of activities including group interaction, lectures, reading, writing, demonstrations, and movement. These spaces may accommodate a variety of audio-visual and teaching equipment for both group and individual use. Adequate electrical outlets should be accessible from various locations. Storage and display space for books and wide range of resource materials is essential. Unless special facilities for art and science are provided elsewhere, the general learning spaces must be equipped to handle these activities in terms of storage and work space. A sink with hot and cold water is useful. Clothes storage facilities, if not located elsewhere in the building, should be provided in the learning space.

An open space structure with no interior walls that may be divided into various learning spaces through the use of bookcases, tables, and other furniture can offer great flexibility. Such space does, however, require special treatment with regard to acoustics — sound absorbing materials on ceiling and walls and carpeting on the floors — and air-conditioning. Provisions for storage of materials must be considered. In all spaces designed for young children, scale is an important consideration. The size of the users must be a planning factor.

SPACES FOR EARLY CHILDHOOD LEARNING

Richly prepared and varied activity areas are desirable. The spaces should encourage spontaneous, as opposed to highly structured, learning situations and provide for many simultaneous activities involving small groups and individuals. The space also will be utilized for large group activities. Frequently children will require personal space in a corner, loft, or pit.

A well-designed early learning center will provide a warm, textured, homelike atmosphere with many activity-oriented areas for water play, painting, reading, fitting and building, music, dance, creative dramatics, science, animal and plant study. Other activities may include nap and eating space. Surfacing materials should be suitable for the activities of the center, i.e., resilient floors (preferably cushioned) and washable vinyl walls in wet and painting areas. Multi-use areas should be carpeted. Warm, incandescent track lighting or variable intensity and multi-directional lighting provides a more pleasing environment then repetitive, static fluorescent lighting. Ample window areas that allow ventilation are desirable even when the facility is air-conditioned. Windows should be low enough to allow a view to natural outdoor settings. Easy access to outdoor play and learning areas should be provided.

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Where parent and teacher training are a part of the early learning center program, an observation room or booth with one-way vision windows is useful. Where an extensive training component is provided, a full classroom accessible from the lobby with one-way vision to learning areas is desirable. This room should be equipped with chalk, tackboard surfaces and projection facilities.

More complete information on space for early childhood learning can be found in An Approach to Programming for Kindergarten Facilities prepared by Joanne Shelbourne Berridge. A serious oversight in planning buildings, Berridge notes, is insufficient storage space allocated for the large size materials used to develop manipulative skills in young children. Her suggestions are:

- The major portion of storage needs to be adjacent to the place where its contents will be in use.
- Storage for teacher use only can be located out of the child's "use" range and still be accessible to the adult.
- One unit of storage needs to be provided that has the property of closure/lock.
- Teachers need places for cumulative records, attendance records, curriculum plans, etc. This does not need to be translated as a DESK.
- Children and teachers need separate places for their wraps and personal belongings.
- A major portion of the "care" of a kindergarten facility is accomplished as the children and teachers work in the environment, therefore equipment and supplies for cleaning need to be immediately available to children and adults.

SECONDARY SCHOOLS

Educational programs and spaces that clearly differentiate between types of learning activities and that require specialized environments are more common in secondary than in elementary schools. However, some curricular areas do not make extraordinary demands in the way of equipment and special effects. Such areas must still provide a pleasant and functional space for the discussion and analysis of information and ideas. These classrooms should respond to spatial requirements, and should feature appropriate lighting, furnishings, storage, display, and chalkboard area.

In the secondary school areas for socialization are especially important. A commons is now typically found in most high schools. Much of the information about specialized learning spaces found later in this Unit is closely related to spaces for the secondary program.

ENVIRONMENTS FOR SPECIAL EDUCATION

Special education programs have been developed to serve the needs of students who fall conspicuously outside the norm. It has variously embraced persons who are physically or health impaired, blind or visually limited, deaf or hard of hearing, language or speech impaired, mentally retarded, brain injured, or developmentally disabled, severely emotionally disturbed or who have emotionally related learning problems, or combinations of these problems. The Educational Facilities Laboratories, Inc. reports that approximately one child in ten now requires some form of special education. Other sources place the figure as high as fifteen percent.

The differences between regular education and special education do not now appear as distinct as they formerly did. Efforts to improve special education to meet needs of students with conspicuous differences have helped illuminate the essential differences among all students. The blurring of the distinctions between regular education and special education and the recognition that all students

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are, in their own way, different has helped pave the way for the introduction of students with conspicuous differences into the mainstream of education. The judicial system has upheld the rights of all young people to equal treatment, equal education, and equal opportunity. With few exceptions, all students must have the right of access to the mainstream of education through placement in the least restrictive environment.

Educators and architects alike must keep pace with and anticipate the conceptual, practical, and legal trends in special education and its relationships to regular education. Failing that, they may later face the need to make costly program and facility changes that with foresight could have been avoided. Educators and architects who simply conform to current minimum standards are likely to be overtaken by the rapid change in the field of special education.

It is certain that there will remain some students whose needs are so highly specialized that they cannot reasonably be accommodated within the mainstream. It is equally certain that there will remain a role for some forms of institutional resources well outside of the educational mainstream that are different in concept and scale from the regular school building. These facilities must be far superior to what they generally are now. The current trend is toward the development of specialized, multiresource, community-based comprehensive centers. An appropriate source of specific guidelines for special education space is Facilities for Special Education Services (1979) prepared by the Maryland State Department of Education. Careful planning is required to eliminate architectural barriers such as steps and curbs, steep and narrow walks, gratings in walkways, narrow doors, small toilet stalls, and drinking fountains and light switches that are out of reach.

The American National Standards Institute (ANSI, 1961) is a valuable source of information regarding accessibility and barrier free environments. Some factors in facility design that assist the students to function safely and with as much mobility as possible are:

- At least one primary building entrance, automatic doors (with pressure sensitive mats and appropriate time-delayed closure) that slide rather than swing open.
- Ramps instead of steps and curbs, both inside and outside buildings.
- Carpeting on floors to reduce slipping and to cushion falls.
- Wide classroom entry-ways without doors (which permit student free access) but which restrict visual and auditory exposure to the corridors.
- Use of safety glass for doors and accessible windows.
- Avoidance of sharp corner surfaces, and projections.
- Toilets that are convenient and available, with space and hardware to permit independence.
- Hardware on doors, sinks and cabinets that can be used by all exceptional students and can be quickly identified by the blind.
- Vertically adjustable chalkboards set approximately 18-24 inches away from the wall to permit use by students in wheelchairs.
- Switches, controls, fire alarms, within reach of people in wheelchairs.
- Horizontally mounted railings or grab bars.
- Furniture that can be adjusted vertically and horizontally to meet the needs of individuals or groups of students.

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- Specially designed storage spaces to accommodate wheelchairs, walkers, standing tables and other large equipment.

- Raised or recessed signage to identify rooms and spaces.

- Additionally, careful attention must be given to emergency and fire protection systems including easily operated emergency doors, barrier free corridors, and warning signals that are comprehensible to all exceptional students.

- Fire alarms, for example, must be equipped with audio signals for the blind and visual signals for the deaf.

LIBRARY/LEARNING RESOURCE CENTER

The learning resource center is a space for the organization, storage, lending, and on-site use of learning aids for all school educational programs. It should house not only conventional library materials, (books, newspapers, periodicals and pamphlets), but also recordings, tapes, filmstrips, slides, microfilm and equipment necessary for their use. The learning resource center should be comfortable and attractive. The environment should be pleasant and the space should be organized to permit quiet, solitary study, group interaction, easy location, inspection and use of materials, and convenient flow of traffic between areas. The success of the center will depend to a large degree, on the organization of space and materials, the furniture and the manner in which the center is operated. Nevertheless, there are environmental features that contribute to the efficiency and comfort of the center. Planners should be in touch with these aspects.

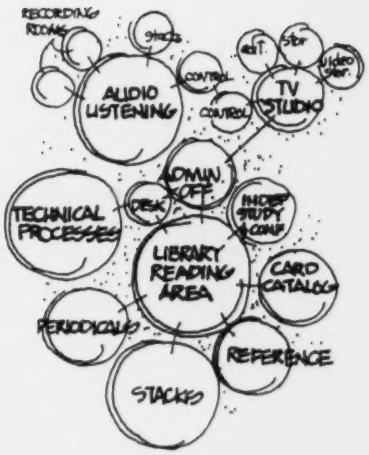
The learning resource center should be centrally located to insure easy access. A main floor location is usually preferable. The center should be located away from noise areas like the gymnasium and should be placed so that physical expansion will be possible if necessary. Another consideration in locating the center is access from outside when other parts of the school building are closed.

The size of the facility should be appropriate for school enrollment and should accommodate the current collection of printed and other materials as well as anticipated acquisitions. The nature of the facility will depend on the educational level of the students although there are some common requirements that are unaffected by the age of the users. For instance, carpeting of floors will insure a low noise level; walls should be treated so that maintenance requirements are not excessive; ceilings should provide desired acoustical level; heating and ventilating outlets should be installed so that they do not interfere with shelving and so that heat flow will not damage books; electrical outlets should be accessible where audio-visual and other equipment will be used.

Normally the learning resources center will contain the following areas; a main reading area; an audio-visual area; an area for independent study and research; conference and seminar space; library workroom and office for the library staff. These areas may be located in separate rooms or may be combined depending on the size of the total space and the complexity of the center.

The main reading area will normally contain tables and chairs, lounge or casual furniture, the card catalogue, circulation desk, reference books, reserve materials, and display space for current periodicals and newspapers. A desirable environment is often created through the use of a variety of work-study seating arrangements. In elementary schools, the main book collection is often located in the reading room whereas in secondary schools, the collection is occasionally housed elsewhere in stacks.

A room or area for the storage and perhaps the use of audio-visual equipment such as record and tapeplayers,



SPATIAL RELATIONSHIPS
LEARNING RESOURCES

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may be part of the center. Electrical outlets are an obvious necessity. Study carrels designed for the individual use of this equipment may be located in the audio-visual room or elsewhere in the center.

Areas for independent study and research may either be included within or separate from the main reading room. The carrels may be wired and otherwise equipped for the use of audio-visual equipment or may be dry. Spaces for group discussion may be located in a separate room, or conference style tables and chairs may be placed in the main reading area. Audio-visual equipment, projection screens and chalkboards may be used. A more informal approach to group use is the provision of casual seating. Group study spaces should be located near resources that will be needed by users. A workroom with appropriate cabinets, shelving, cupboards, electrical outlets, and a sink with hot and cold water should be provided. The workroom can be used for the preparation of materials for circulation, repair, and possibly storage space for items not in use.

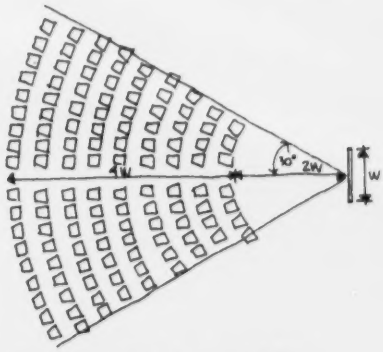
The office for the library staff that should accommodate a desk, chair, filing cabinet, shelving and other specified equipment, may be located in connection with the workroom.

Shelving is of primary importance. Its quality and size must be carefully calculated and it should be adjustable to assure flexibility. The height of shelving units should be geared to the size and age of students. Heights between shelves should be appropriate for the size and volumes to be stored. Picture books used in elementary schools may be displayed differently and because of their size may require larger shelves than those used in secondary schools. Stack type shelving for printed material that is common in secondary school centers should be centrally located, accessible, carefully organized and convenient for traffic flow.

If a television and/or radio studio is planned as part of the complex either for the teaching of broadcasting techniques or for use in the creation of instructional materials for other educational programs within the school, the environment needs must be carefully investigated to accommodate specialized equipment.

FACILITIES FOR INSTRUCTION USING AUDIO-VISUAL TECHNOLOGY

The frequency with which audio-visual equipment is used in the classroom will vary directly with its availability and ease of use. Providing basic facilities such as a projection screen and adequate outlets in each teaching station will allow frequent and convenient use of instructional machinery.



SEATING GUIDELINES
PROJECTION SCREEN VIEWING

Two basic guidelines should be employed when installing projection screens. First, no viewers should be closer to the screen than twice the screen width. Second, all viewers must be seated inside an imaginary thirty degree cone around the projection axis line. These two guidelines, when overlapped, define the four sides of the area in which viewers can be seated. By using these guidelines the facility planner can determine the size screen needed for a given audience space. These guidelines are appropriate for the more popular matte screen surface but will vary for glass beaded, lenticular, and other screen surfaces.

The screen should be positioned so that the surface is perpendicular to the projection axis line. If the surface is not perpendicular, the projected image will be distorted into a keystone shape. In most cases, particularly with the overhead projector, the screen will be at an angle to the wall. Special brackets are available for this purpose.

Adequate electricity is another necessity for successful use of educational media. The equipment, particularly projectors, consumes a large quantity

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of power. The capacity of a circuit must therefore be adequate for the anticipated equipment. Individualized instruction, involving a dozen or more machines operating in the same space creates a heavy load on electrical circuits. The location of electrical outlets must be planned carefully. The exact locations will be determined by the configurations of the space and the planned program. With the expansion of individualized programs that use media, all classrooms should have electrical outlets every twelve feet along the walls. This spacing will permit individual students and small groups to use the equipment. Without the proper placement of outlets, extension cords that present both a physical and a fire hazard must be used.

Although the need for some conventional projection may remain for special purposes the use of television receivers can be determined using two basic guidelines. First, no viewers should be closer than four times the screen width (not the diagonal) and no further away than twelve times the screen width. Second, all viewers should be seated within an imaginary forty-five degree cone around the axis of the television screen.

With modern construction techniques, the cost of installing wiring after a building is complete is prohibitive. Therefore, an adequate empty conduit system should be installed connecting all teaching stations with a central distribution area. These conduits can be used for the installation of computer cables, tele-communication wires, or other systems that are generally found in new buildings.

Several environmental factors affect the use of media in schools. Among these are extraneous light control, illumination, ventilation, and acoustics. All windows need some form of light control so that the room can be darkened for media presentations. This control can be full closure blinds, overlapping screens, or drapes. In large open space schools extraneous light from adjacent areas also may need to be controlled by positioning the screen and the audience so that the ambient light falls upon the audience and not the screen.

The illumination within the room or teaching station also needs adequate control. The controls should be easily accessible to the instructor and should allow dimming of particular zones or light groups. Normal ventilation problems are compounded by the heat produced by equipment. While the heat produced by one piece of equipment is negligible, several slide projectors in carrels will produce considerable heat that must be recycled or exhausted.

The last major environmental factor that must be considered is acoustics. The proper design of the walls, floor and ceiling surfaces will enhance or restrict the transmission sound. In spaces where large groups of students listen to a single sound source, the room should be designed to direct the sound to the audience. Areas for individual study should be designed to absorb sound.

LEARNING AREAS FOR COMPUTER INSTRUCTION

Learning laboratories for computer instruction are found at both elementary and secondary school levels. Although computers are not utilized at various locations throughout the building, most schools currently have a need for group instruction in the basic skills of computer usage. It can be expected that computer literacy will continue to be taught in schools for the next decade or more. Eventually even young children will come to school with basic skills already learned at home or the market place. Until that time computer labs will have a place in school facilities.

Careful planning for a centralized classroom space will greatly enhance the program. Consideration needs to be given to the size, shape, location, and lighting. Typically a room larger than a regular classroom is needed. A

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telephone line and special electrical wiring are essential. Avoidance of a poorly shaped room will add to the program efficiency.

Several factors are especially relevant for this learning area. For example, dust-free boards rather than chalkboards are needed. An adequate number of separate electrical circuits and outlets will be necessary to accommodate the needed power and flexibility of room arrangements. More than the usual amount of shelves, cabinets, and storage spaces are needed. The temperature control unit should be independent of other building areas.

The use of carpet as surface covering for the floor will greatly improve the acoustical environment. Consideration of the above characteristics will promote both teaching and learning.

SPECIALIZED LEARNING SPACES

The involvement of the teaching faculty is essential in the development of plans for spaces where experimental learning will occur and where special activities and equipment must be accommodated. Studios, laboratories and specialized spaces for fine arts, music, dramatics, science, physical education, home making, industrial arts and business education require particular attention to insure that they meet enrollment and programmatic needs.

FINE ARTS

In many contemporary schools the fine arts are viewed as comprising both the visual and performing arts. The information contained in this part of the Unit is separated according to that approach. Where less comprehensive programs are offered the details provided can be adapted to specific needs.

VISUAL ARTS

In elementary schools, the visual arts program includes painting, drawing, construction, modeling, carving, photography, print making and weaving. The basic media used are finger paints, clay, paper-mache, water color, wood, chalk, tempera, brush and ink, charcoal, pencils, and scrap materials. In secondary schools, activities may include three-dimensional construction projects, graphic arts, mechanical and fine art drawing, modeling, sculpture, ceramics, painting and photography. Some important media in use are wax and oil crayons, charcoal, watercolors, tempera, enamels, wood, metal, plastic, textiles, ink, yarns, clay, leather, wire, reed, and raffia.

It is advisable to have art learning spaces located on the ground floor with access to related curricular areas and convenient entry for delivery purposes. If the spaces are to be used by adult groups after regular school hours, they should permit easy entry from the outside. During school hours, students also need ready access to the out-of-doors for sketching, painting and field trips.

On the elementary level, art activities are best performed on tables with mar-resistant surfaces. Other essential equipment and furnishings include storage cabinets; clay bins; a tool cart with saws, hammers, drills, files, chisels, and easels; workbenches with vises; projectors, screens, and other audio-visual devices and a kiln to be operated by the teacher. In programs designed for older students, activity spaces may be equipped with movable tables and stools, one or more clay and enamel kilns, jigsaws, drill presses, grinders, buffers, workbenches, drafting tables, easels, metal covered counters, craft tables, clay trapping floor drains, drying racks, hooded spray booths, plaster of paris bins, an oven for plastics, a printing press, paper cutters, sewing machines, chalkboards, tackboards, projectors, screens and other audio-visual devices. These items may be found in many art rooms, but usually not all would be required.

Electrical outlets need to be accessible from many places in the art learning spaces. Some stationary

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equipment should be directly connected to electricity. Several spaces also need large, deep, acid-resistant sinks surrounded by built-in cabinets. Sinks should have traps and drainboards or built-in drying racks.

Illumination which is glare free, intense enough for detailed work and allows true color discrimination is vital. Natural light from northern windows is ideal.

When photography is included in the visual arts programs, a darkroom will be needed if the program is more than elementary. Darkroom equipment should include good light control devices, possibly a light-tight door, a sink with hot and cold water, workcounters, general storage, light-proof storage, and the necessary developing, enlarging and printing equipment.
Spaces for learning experiences in drafting need to be provided for both group instruction and individual work. Special consideration should be given to the lighting conditions in the space. Storage should be designed for wide materials, and shelves in cabinets should be adjustable. Built-in racks for books and magazines also may be provided.

Paints, acids, cleaners, and other inflammable or combustible items should be stored in locked, metal cabinets. Perforated pressboard with hanging devices are useful for storing tools. Large, flat, easily manipulated drawers for oversize watercolor paper and poster board enable easy access and proper storage of materials. Storage of partially completed projects may be on shelves in the art room or in an adjacent room. Locked drawers designed to function as tote trays, or with tote trays in the interior, should be provided for the storage of jewelry, leather, and expensive and delicate materials and tools.

Deep display cases should be built as part of the walls separating art spaces within the building. They should have adjustable shelves for three dimensional objects, an electric outlet, and tackable sides and back. Other cases for displaying students' work can be exhibited near entry-ways of auditoriums, cafeterias, commons and other public areas.

Many types of floor finishes are not satisfactory for visual art rooms. Close grained hardwood, such as good quality maple, makes a sturdy art room floor that can be refinished easily. Maple, if well finished, does not absorb odors nor stain readily. Light-colored rubber asphalt, vinyl asbestos, or vinyl tile are all light reflecting, easily maintained, and less fatiguing than stone or concrete although treated concrete floors may be considered for metal sculpture areas. Patterned tile shows soil or stain less readily than solid colors.

Visual art teachers must have ample work space and in some schools, art workrooms for teachers are separated from the student art areas. In smaller schools, this area may be incorporated within a supply and storage room.

THE PERFORMING ARTS

Included here are dramatics, music, and dance. Although the emphasis at the elementary school level will be largely that of developing an awareness and interest, the secondary programs lead directly to skill development as a possible entree to a specific profession.

DRAMATICS

The conventional school auditorium used for lectures, vocal and instrumental concerts, pep rallies, commencement exercises as well as numerous other school and community activities is normally inappropriate for dramatic productions. Generally these facilities lack proper lighting capabilities, enough backstage area, good theatrical acoustics, an intimate performer-audience relationship, and dressing room, storage and construction space. Because theatre has very specialized spatial and physical requirements, any school that operates a serious performing arts program should

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consider a separate environment for its activities. Experimental or laboratory theatres are ideal for this purpose.

Actually, a suitable space for dramatics can be provided in a large, relatively unfinished room that functions as an instructional, rehearsal, and performance area as well as a workshop for scene construction and painting. This space may be located near the auditorium to take advantage of existing lobby facilities (ticket sales, toilets) and other audience services (parking space). Any space to which easy access can be provided is suitable. Proximity to industrial arts, homemaking or areas for visual arts may be desirable if a working relationship with these programs can be established. Unfortunately such cooperation is often difficult to maintain due to dissimilarity of procedures and goals.

A laboratory theatre should possess the following features:

- A wood floor - tile and concrete are inappropriate - of 2"X 6" yellow pine, tongue and groove, set on sleepers to allow give. A wood floor is imperative since scenery and equipment must be fastened into the surface.

- A large work sink with heavy duty plumbing and removable trap should be located in the section to be used for scene construction and painting.

- Adequate circuitry and electrical outlets are essential. Normal 10 volt circuitry is sufficient unless bench type equipment is to be used. Ordinarily, basic set construction can be done with hand and hand-held power tools.

- Installation of special wiring for theatrical lighting will require the advice of a theatrical lighting consultant. These persons can be identified through university theatre departments, United Scenic Artists' offices in New York, Chicago and Los Angeles, or the consultant referral service of the U.S. Institute for Theatre Technology.

- Space and equipment for costume construction are necessary if a cooperative arrangement cannot be negotiated with the home arts department. Costume construction requires at least work tables, sewing machines and ironing facilities. Costume storage should be humidity controlled to prevent dry rot and mildew.

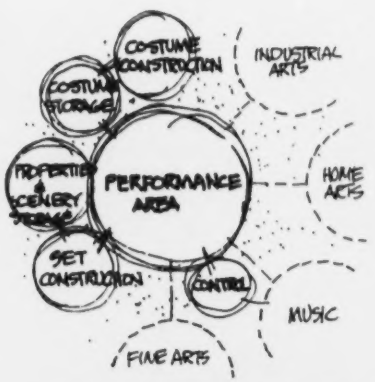
- Storage space for properties and scenery should be provided. Storage for tools and hardware, paint, glue should be conveniently located near the set construction area.

- A pipe grid or catwalk system for lighting should be installed.

- A control booth for light and sound that is sound-isolated may be a separate room with a window on the performance space or located on a peripheral cat walk.

- Audience seating (75-150 capacity is appropriate) can be provided on collapsible risers and portable chairs that can be moved to satisfy a variety of production situations. Pull-out risers also can be used but they are inflexible.

In general all the above requirements involve a larger investment for equipment than for the structure itself. Educational theatre needs a workshop, not an elaborate auditorium. Laboratory theatres should be functional. They should allow experimentation with acting, directing and technical aspects of theatre. An informal, but suitably equipped, multipurpose space like the one suggested above will serve well and economically as a learning area. Many other laboratory theatre designs are possible. For more information, see Theatres and Auditoriums by Burris-Meyer & Cole.



SPATIAL RELATIONSHIPS
LABORATORY THEATRE

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MUSIC

Physical and spatial requirements for music education obviously exceed the capacity of the conventional classroom. Spaces for individual and group, vocal and instrumental instruction and rehearsal are usually necessary. The size, quality and number of spaces will be determined by the enrollment and the educational level of the school, the scope and sophistication of the music program, and by the encouragement offered for music education by the administration and the community.

The following spaces may be required by the performing arts program in music:

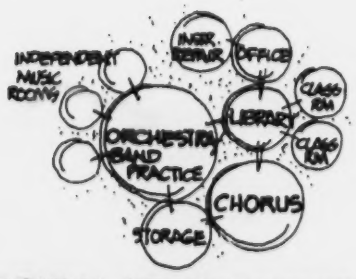
- Teaching spaces for instrumental and vocal instruction on an individual and group basis. The size of these spaces will depend on enrollment and organization of classes, educational goals, and required equipment.
- Classrooms for teaching music theory, history, etc.
- Rehearsal room for individuals and small groups. Acoustical treatment of these spaces is critical.
- Offices for the faculty and staff, some of which may double as studios.
- Library for recordings, tapes and sheet music.
- Space and equipment for sorting and cataloging should be considered. The size of the area will be determined by the size of present holdings and the acquisition/elimination policies of the department.
- Listening area equipped for the playing of records and tapes.
- Storage areas to accommodate musical instruments, teaching aids, uniforms, music stands, risers, shells, lights, and other performance apparatus. These should be located close to areas where equipment will be used.
- Secure storage space for privately owned instruments.
- Performance area that may be shared with other departments or designed specifically for the use by the music department. (Auditoriums are discussed in Unit H, "Auxiliary Spaces.")
- Facilities for recording, instrument repair and an experimental music studio are other possibilities.

Design considerations related to music education facilities involve careful attention to acoustics, room size, shape, temperature, relative humidity and spatial relationships.

Acoustics are obviously critical and often a consultant can be helpful in designing spaces which will enhance the quality of sound. Surface materials that eliminate distortions and undesirable transmissions of sound can be applied. Windows, doors, walls and floors should be treated so that transmission of sounds to and from other areas is reduced. Air ducts should be acoustically lined. Noisy HVAC equipment should be located away from music facilities. Corridors, storage areas and other non-learning spaces can be used as buffers to prevent aural distractions.

The shape of rooms for group vocal and instrumental instruction affects the quality of sound. Trapezoidal rooms are optimal, both from an aural and visual standard classrooms, usually 14' to 18' feet. If risers are built-in, they should be carefully designed because of their inflexibility. Although rooms for vocal and instrumental instruction have different requirements, they may be combined if necessary but not to the full advantage of either use.

The thermal environment of both in-



SPATIAL RELATIONSHIPS
MUSIC

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structional, practice, and storage areas is important. Fluctuating temperatures and low humidity are detrimental to musical instruments, wooden ones in particular. Therefore, a constant temperature from 64 degrees to 73 degrees should be maintained. Relative humidity of 40% to 50% is acceptable.

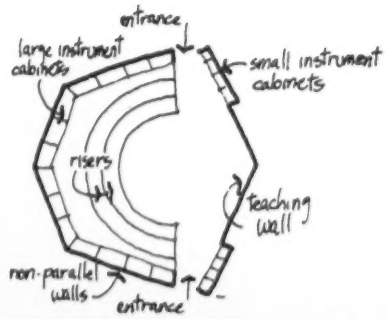
The efficiency of the music complex will depend on spatial interrelationships and the relationship of the complex to the other facilities within the school building. Public access and proximity to a loading dock allowing movement of equipment, to dramatics, visual arts and the performance areas are advantageous. Educational efficiency is promoted by grouping spaces within the complex that are functionally related, i.e., the music library and listening areas or practice rooms and instructional areas.

Proper illumination is an important consideration; lighting should be intense enough so that musicians can read music which is farther away than normal reading material. Electrical outlets should be located where needed. Ventilation is obviously important here as in all other learning spaces. Security of school and privately owned equipment should be considered.

DANCE

Although dance programs often have the misfortune of being under the auspices of the physical education program where they almost always suffer financially and artistically, their physical and spatial needs should be considered separately or in conjunction with other performing arts areas like drama and music. Dance programs have specific environmental requirements that are rather inflexible. Instructional and rehearsal space for dance requires hardwood flooring that is properly installed on sleepers, not laid on top of concrete, or any surface that will not give. Rigid flooring can cause leg injury. One wall of the dance studio should be mirrored with provisions for covering. An exercise bar should be installed. Good ventilation is essential. The thermal environment should be warm to prevent muscle strain. Storage space should be provided for costuming, rhythm instruments, records and tapes. Electrical outlets for record and tape players are essential. Dressing room space should be available to dancers either exclusively or on a shared basis.

The rehearsal/instruction area described above could be used for dramatics provided that the floor is protected. The dramatics performance area described earlier may be used for dance if a portable dance floor is installed. The large multi-purpose auditorium is usually impractical for dance performance primarily because of the inadequacy of floor surface and lighting.



INSTRUMENT REHEARSAL

OTHER SPECIALIZED AREAS:

SCIENCE

Science laboratories may be incorporated into science lecture spaces, may be multiple purpose to serve different science programs, or may be designed for specific courses. The specialization and sophistication of these facilities will depend largely on the size and resources of the school. This section will consider both general and specialized lab spaces.

General laboratory spaces: Combination lab/general learning areas require space for lecture, use of audio-visual devices, individual and group project work, demonstrations, and group discussion. Flexibility within the area to meet the needs of different activities can be achieved by locating base counters and wall cabinets on the periphery of the room with the central area left open for lecture purposes. Adequate sinks, hot and cold water, gas, air or vacuum (if needed), and electrical outlets should be provided based on class size during the anticipated enrollment peak. Chairs and tables may be best for student seating because of their flexibility. If the

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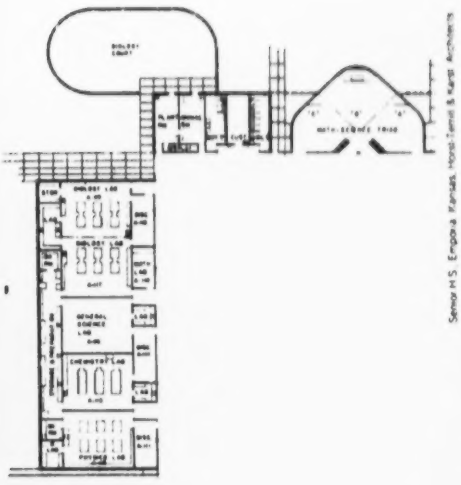

work counter and student tables are the same height, the need for separate seating for lecture and lab work is eliminated - an advantage in terms of space and cost.

The furniture and equipment to be accommodated within general science lab areas are a demonstration desk with all utilities, adequate chalkboard and tackboard space, adjustable shelving for reading-reference center with appropriate tables and chairs, plenty of storage space, low voltage direct current (if needed), portable aquariums, terrariums, etc. and two and three dimensional display units. Display area visible from corridors may be desirable.

Provision should be made for storage of all types of equipment, instructional supplies, learning aids, individual student or teacher experimental work. Work counter space for preparation of demonstrations also should be considered.

Multi-purpose labs also can be achieved by planning (1) one-way facing tables with a demonstration desk in the front of the room and the entire room being used for all activities, (2) separate areas at opposite ends of the laboratory for demonstration-discussion and laboratory activities, and (3) a perimeter arrangement of tables and work counters along two or three walls with a demonstration/desk and pupil tables along another wall, and research and other related activities grouped elsewhere.

Most schools have sufficient students enrolled in separate courses for full utilization of separate action learning laboratories for biology, chemistry and physics. General learning spaces for demonstrations, lectures and discussion may be shared or separate.

Biology: The overall design of a biology lab should include wall and floor surfaces planned for effective housekeeping. Floors, tables, worktops and counters should be resistant to water and warpage and easily cleaned, especially in areas where plants and animals, supplies and equipment are kept. Many activities such as dissection require more than general illumination. Auxiliary lighting also may be required for such special spaces as growing areas. Areas where animals are kept need to be fully ventilated.

Refrigerators, pressure cookers, autoclaves, units for cooking and drying such as a kitchen range, incubators, portable AC/DC power supply units, centrifuge, or a fume hood are some major items of equipment that may need to be accommodated. If spaces for raising and experimenting with terrestrial and aquatic animals and plants are planned, they will require environmental controls for humidity, ventilation and heat independent from the building's main system so that proper conditions can be maintained when the central system is not operative. Durable materials, water supply, and floor drains, should be considered in designing this area.

Access to outdoor learning areas is an important consideration. Outdoor spaces should be surfaced, have storage and work areas and some form of overhead shelter.

Chemistry: Arrangement and equipping of the chemistry laboratory will depend on the education program and required flexibility. Generally, laboratory desks should have sinks, hot/cold water, gas, electrical outlets, compressed air and vacuum (if needed), shelves, storage drawers, and cabinets. Tops of all work surfaces should be appropriate for planned use. Stone, resin, colorlith, soapstone, and pressboard are possible materials. Gas and adequate circuitry and electrical outlets should be available at various places in the lab. Portable power packs may be used to convert AC power to DC power. Each student should have a lockable space at the lab station for storage of frequently used hardware such as test tubes and beakers. Storage space also may be needed for students' personal para-

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phernalia - books, briefcases, and clothing. A wall sink with double drain boards and storage counter below may be needed in the main lab depending on the number and size of sinks provided at student work centers and in the storage and/or preparation room(s).

Bulletin board and chalkboard space should be provided in the chemistry lab for display and lecture use. Shelving for equipment, models, and charts will be needed. Some storage units may serve dually as display space. Good lighting, electrical outlets, and possibly a water supply and drainage may be provided in the display area.

Storage for chemicals and apparatus should be located in a separate room, although stored items should be readily accessible. All toxic chemicals should be stored in locked cabinets. (Cabinets for sorting chemicals must resist corrosion and may require ventilation). The storage area and preparation room may be conveniently combined. A refrigerator may be needed. Other equipment requirements for chemistry labs include fire extinguishers, blankets, emergency showers, or eyewash fountains, and first aid supplies and equipment. Master controls for utilities should be placed at a convenient central location. Wheeled equipment carts of acid resistant materials for transporting equipment and supplies and for use in distribution centers should be accommodated. Fume hoods also are required to remove toxic gases from the chemistry lab.

Physics: The following are basic physical and spatial requirements for a physics laboratory: (1) laboratory equipment and student storage space; (2) portable compressed air and vacuum systems at the demonstration stations and at various other locations throughout the physics space; (3) controlled light area for experiments with optics and for certain kinds of photographic work; (4) both alternating and variable voltage direct current at the instructor's desk and at various points throughout the physics area; (5) a small workshop for student and teacher preparation and for small group work.

Space is needed for teacher preparation as well as storage for supplies, equipment, projects, and instructional and learning materials. Developmental research, and special project activities may need to be accommodated. Preparation rooms adjacent to the physics lab or adjoining two labs should include a sink equipped with a preparation table with hot and cold water, gas and electricity.

An equipment truck, teacher's desk, filing space, research facilities and a work bench may also need to be accommodated. Shelving and cabinets for storage and distribution of supplies, equipment and apparatus usually not kept in the physics lab should accommodate items of various sizes and shapes. Accessibility should be considered in planning.

Spaces for teachers and interested students to work on individual or group projects also may be required in a physics lab. Careful assessment of the number of students who will engage in such a program and the activities undertaken are necessary in planning these spaces.

Astronomy, meteorology and geology are other sciences that may be included in secondary school programs. If so, the extent to which these curricular areas can use the laboratory spaces described above or, if funding and interest are substantial, the desirability of planning special facilities will have to be assessed.

PHYSICAL EDUCATION, ATHLETICS AND RECREATION

Indoor facilities for physical education, athletics and recreation present a wide range of variables affecting their development. The education program, the school's involvement in competitive and spectator athletics, the rela-

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tionship to community recreational programs and facilities, available funding, the size of the school, the age of the students and the climate are some important factors affecting the nature of the school's physical education facilities. In spite of these variables, there are nevertheless a few generalized recommendations that should be useful to planners.

As with other program areas, it is essential that the physical education staff be involved in the planning of the facility, that the program be fully outlined, and that its requirements in terms of space and equipment be clearly understood. Due to the difficulty and cost of expanding physical education facilities, requirements for both immediate and long-range use should be considered during the initial planning stages. Possibilities for cooperation in the development and use of the facility should be investigated with interested agencies and groups. Economy of operation, particularly with regard to energy use, is another critical concern. Fuel conservation may have to be reconciled with extended use of the facilities.

Other current needs affecting space for physical education, athletics and recreation deal with provision of equal facilities for women and men, facilities suitable for physically impaired persons, facilities for participatory and lifetime sports, and facilities that are flexible and useable for a variety of activities.

The size and layout of the physical education facility will depend on the type of school and the program to implemented. Obviously, elementary and secondary schools do not have the same needs. Generally, elementary school gymnasiums are smaller and do not require extensive dressing rooms, a storage and office space. Occasionally the elementary school gymnasium may be planned to serve a dual function as a cafeteria during part of the school day. However, some guidelines for larger, more complex secondary school facilities are applicable to these spaces.

Factors to be considered in planning facilities for physical education, recreation and athletics are:

- Physical education facilities should be isolated from classrooms where noise would be distracting.
- Space and area relationships should be carefully analyzed.
- The number of needed teaching stations should be determined.
- Traffic patterns of students, other users, and spectators should be examined.
- Safety of users is a vital concern. Non-slip floors and non-abrasive wall surfaces should be provided. No sharp edges and corners should be exposed.
- Attention should be paid to durability of materials used on surfaces and furnishings.
- Low-cost maintenance is an important consideration.
- Electrical outlets should be provided where needed.
- Proper acoustics are vital to reduce noise, reverberation, and echo.
- Ventilation needs in main facility and auxiliary areas should be examined.
- Lighting will require special attention to insure installation of suitable fixtures that are recessed or shielded and adequate in terms of quality and areas of illumination.
- Windows in gymnasiums should be elevated and protected.
- Communication systems should be considered if needed.
- Entrances/exits should be located with regard for traffics flow; doors should swing out and should be flush with the floor.

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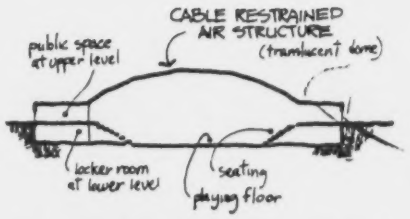
- Special arrangements for fixed equipment (i.e., Basketball backstops) and suspended apparatus for gymnastics should be considered.
- Facilities for emergency first aid should be provided.
- Offices for staff should be conveniently located.
- The location of indoor areas (dressing, showers, etc.) should be accessible from outdoor recreational areas and playing fields. The interrelationships of indoor and outdoor facilities should be carefully considered during planning.
- Locker areas and dressing rooms should be adequate for the numbers and size of the users.
- If the floors are to be flushed, they should be sloped and equipped with drain holes along the perimeter of the room.
- Floors of locker, shower and drying rooms should be surfaced with non-slip ceramic tile; concrete is not recommended.
- Drinking fountains (usually recessed) should be provided in locker areas.
- Storage areas for equipment should be adequate in size, conveniently located, and accessible to play areas. Outside storage accessible from outdoor playing fields should be considered.
- Hallways, ramps, and doors without thresholds and upright central supports should allow movement of equipment.
- Attention should be paid to security of storage areas.
- If space is to be used for spectator sports, provisions for the spectator (such as seating, toilets, ticket purchase, access to buildings and parking) must be studied.
- Accessibility from main entrance and parking areas should be considered.

It is possible to design a physical education facility to accommodate a variety of activities. Options increase with the size of the space. Modules measuring 60' x 120' can handle basketball, tennis, volleyball or badminton as well as other activities. The use of several modules provides even greater flexibility. Spaces can be divided with folding partitions or with roll-down nets with or without opaque screens. Synthetic flooring surfaces that have a variety of floor markings make transition in use possible. Floor sockets allow easy conversion to sports requiring nets. Wood flooring, while it has definite merits, is expensive and impractical for large expanses. Also, the permanence of markings may discourage multiple use.

Major activity spaces usually involve a large open span that must be covered. When conventional structural techniques are too heavy and expensive, lightweight non-rigid coverings can be employed. These are available in a variety of heavy duty, fire-proof fabrics with long-life capacity. The material can be fabricated in layers to create air pockets for insulation. Because it is translucent, artificial illumination is not required during daylight hours. Air supported fabric structures are somewhat inexpensive, are available in a variety of shapes and sizes, and are demountable. Tent structures also can be used for roofing large spans. These new products and methods increase the possibilities for multipurpose physical educational facilities and allow the realization of a wide range of building plans.

Activities which, because of their specialized nature, cannot use the main facility, will require separate spaces. An example of these is handball that requires a specially designed court. The physical and spatial needs of such activities must be investigated. Another possible component for a school physical education/athletics/recreation



AIR SUPPORTED FABRIC STRUCTURE

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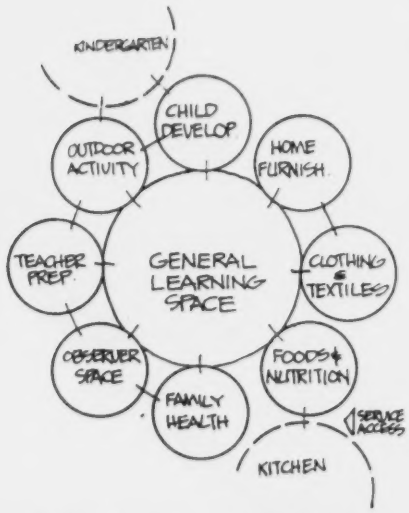

SPATIAL RELATIONSHIPS
HOME ARTS

facility is a swimming pool, the size, type and quality of which will depend on intended use — competition, diving, instruction, recreation, and so on.

DISTRIBUTIVE EDUCATION

There is no consistency in the assignment of distributive education to a curricular area: some schools associate the program with homemaking; elsewhere it is treated as an aspect of business education. Whatever its programmatic affiliation distributive education has more specific spatial and physical requirements that should be accommodated. The room should be large enough to accommodate tables, rather than desks, for student seating and work. Large, flat surfaces are necessary. Ample storage space — maybe even an additional room with cabinets and shelving — is important. Storage space is needed for display props and other marketing/merchandising supplies. Display counters are needed as well as an illuminated window display case facing a corridor. A sink with hot and cold water may be required. Office space for the instructor should be provided.

Distributive education spaces may be located near the main entrance of the school to allow easy delivery of supplies and access to class visitors. Sound isolation is not as important for this area as it is for some others.

BUSINESS EDUCATION

Spaces for business education, whether they are distinct learning areas within a common space or separate rooms, usually accommodate instruction in and experience with word processing, office bookkeeping and accounting, and use of general business machines, adding machines, duplicating equipment, and computers. The character and design business education spaces will depend on the nature of the instructional program, the students involved, and resources of the school.

Special environmental requirements are underfloor electrical circuitry in rooms where typing, bookkeeping and shorthand will be taught and practiced. Adequate circuitry with both floor and wall outlets are essential for convenient placement of all business machines. A master control switch is useful in these areas. Ceilings should be acoustically treated. Carpeting should be considered as a floor covering in typing and other areas. Chalkboard installation will depend on the use of the room. For instance, a typing room will require little chalkboard space, whereas the room in which bookkeeping/accounting is studied should be furnished with chalkboards. Cabinets, shelving, and closets for storage should be determined in advance and provided comparable to typical instruction areas. The arrangement of typing rooms should be such that natural light entering through windows is to the typists' right illuminating copied material. In an area where duplicating machines are being used, there should be a sink with hot and cold water. Work counters are important. Space should be large enough to accommodate persons, machinery and furniture and to allow easy traffic flow.

HOME MAKING

In most institutions the home making program focuses on human beings and their home environments in an attempt to aid students in acquiring the skills that will enable them to establish a successful home life and to pursue a vocation.

The learning center for the home arts requires several learning spaces that are equipped to meet diverse educational objectives. To minimize problems of delivery service, waste removal, and adult and student traffic, a first floor location is advantageous. The amount and size of equipment used and the number of students to be accommodated will determine size of space. Besides a general learning area for lecture and discussion, home furnishings, foods and nutrition, clothing and textiles, and family health may be required.

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A space for teaching child development may be structured as a play school for young children. If a nursery school is an ongoing part of the school's educational program, accessibility to classes in home economics may be desirable. Easy storage of equipment should be planned. Safe and comfortable indoor and outdoor space should be designed for groups of six to ten small children and an equal number of home arts students. Accessibility to toilet and wash basin facilities suitable for small children is necessary. Space to seat observers (that part of the class not actively participating in the program) is desirable. Space for ten to fifteen observers behind a one-way screen is useful.

A center for learning about housing and home furnishings should be large enough to simulate living conditions desired by the community. Space should be provided for demonstration and laboratory activities involving the operation of and experimentation with household equipment such as sweepers, floor polishers, washers, dryers and other electrical appliances. Convenient access to the kitchen area is necessary where other items may be tested by individuals or by small groups. Tables, chairs, book shelves, beds, couches, lamps, flower containers, household textiles and other equipment used in the study of home furnishings should be accommodated if used.

Spatial, equipment, and mechanical needs for the study of food and nutrition may include unit kitchens typical of those found in the community, work space with durable surfaces, portable or stationary appliances, cabinets with durable surfaces, shelves and dividers, electrical outlets and gases connections suitable for appliances, hot and cold water connections for sinks, and ventilation hoods.

Instruction in and experience with clothing and textiles probably will require space and equipment for cutting, sewing, fitting, storing, and other activities related to clothing selection, care, repair, design and construction. Possible facility needs are: (1) space and seating for groups at tables with plenty of room for clothing construction; (2) folding tables and portable cutting boards; (3) portable and/or stationary sewing machines and convenient electrical outlets; (4) storage spaces for garments, accessories and clothing exhibits; (5) fitting room with adjustable mirrors; (6) access to laundry equipment; (7) pressing and ironing equipment.

Space for instruction in family health should accommodate facilities for testing home sanitation methods and for solving problems related to family health. Storage space and a model family medicine cabinet may need to be accommodated.

Finally, a space may be needed for teachers' use in preparing instructional materials, conferring with students, and storing students records and reports.

Multiple purpose learning spaces may be desirable or essential and are not difficult to arrange. For instance, a space for family living can be used for teaching housing, home furnishings, care of a convalescent in the home, child development, home management, and family relations. Projectors for visual aids, mobile units, convenient storage and uncommitted floor space will increase flexibility. A space designed for the study of foods and nutrition probably will not be as flexible as some other spaces because of the need for large, heavy equipment, but, by limiting the number of pieces and by locating all non-mobile equipment around the wall, some flexibility is possible because the main floor space is clear.

Tile floors are suitable in home making complexes or rooms although carpeting may be preferable in certain areas. Wall finishes should be easy to clean. Acoustics should be carefully designed.

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INDUSTRIAL ARTS

An industrial arts lab may include spaces for work with wood, metal, plastics, electricity, and drafting. The space should be arranged to allow convenient sharing of equipment where appropriate. Effective design is also achieved by clustering clean, quiet areas, clean but noisy areas, and dirty, noisy areas to avoid conflict and disturbance. Shops should be located on the building's grade level with a service entrance to allow delivery of supplies and to enable the development and use of outside work and storage areas. Storage space for lumber and other supplies is vital and should be located near the delivery entrance.

Spatial consideration should be given to the safety of pupils and teachers. Particular attention should be directed toward provision of adequate space for each activity and unobstructed visibility throughout the work area. Equipment should be arranged to isolate machine operators from traffic and to provide adequate aisles between various parts of the shop. Other factors that have bearing on safety include proper painting of floor areas where danger exists, selection of proper floor coverings for various shop activities, and provision of appropriate fire-extinguishing equipment, particularly where spray painting is practiced. Each machine should be equipped with a start-stop breaker located within easy emergency reach of the operator. Other emergency switches should be located throughout the room.

It is imperative that electrical, mechanical, plumbing and structural systems be carefully planned and coordinate with the equipment to be used. All machinery should be electrically grounded. A ventilation system is essential for the health and safety of the facility's users. Hoods for exhaust systems should be installed particularly where hot metals live engines and spray booths or plastics are used. Dust collection systems with flexible suction heads should be installed on woodworking equipment, especially the wood planers, jointers, and belt sanders. Finishing booths for hot metals and painting and automotive shops require ventilation.

Potentially dangerous equipment such as lathes and band saws should be located to receive natural light during the daytime and artificial as well as emergency lighting at night. This provision minimizes the potential for an accident in the event of a power failure causing a loss of primary lighting. Natural light and ventilation are also important for purposes of energy conservation. Outlets using 120 voltage should be conveniently located for the use of portable power tools. Hot and cold water and appropriate clean up facilities should be accommodated. Areas where portable and bench power tools are kept should be lockable so that unsupervised use cannot occur.

The use of sound-absorptive materials in ceiling is critical. Demountable metal walls are functional for areas not requiring plumbing because they will allow for rearrangement at minimal costs. Wall surfaces should be coated with durable, easily cleaned surfaces. Overhead buss bars are useful for electrical service in many shops. Interior and exterior metal doors are suggested for all trade and vocational shop entrances and exists. Hardwood maple floors, tongue and grooved, are effective where woodworking equipment and tools are used. Concrete is needed in hot metals, transportation, and power mechanics areas. Resilient tile, such as vinyl, asbestos, asphalt, cork, and rubber can be used in the office and in electronics spaces.

Conveniently placed tools and supply centers in each shop are necessary for storing general supplies and tools. Where several shops are clustered into one center, tool and supply centers may be designed to serve adjoining shops. It is highly desirable to decentralize storage for tools that are used exclusively in particular activity areas. This can be done by installing

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tool storage and display panels or by providing portable ones. It is also desirable to place rough metal-trimming equipment in or near supply rooms in order to avoid handling of large and awkward pieces of stock in work areas. Supply centers should allow convenient delivery of supplies. These centers need doors of sufficient width to permit passage of heavy equipment, large pieces of material, and vehicles. A room or space should be provided for student project storage. The amount of space needed will vary with the type of work being done. In some cases, lockers under benches are adequate; in other cases, a storage room with bins and adjustable shelving is necessary, particularly where facilities are used for evening adult classes.

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AUXILIARY SPACES

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AUXILIARY SPACES

Auxiliary spaces in educational facilities support the instructional program and accommodate out-of-classroom needs of both students and staff. The design possibilities for such spaces have increased with the emergence of diverse concepts in school design, increased use of non-printed media, expanded awareness of student/teacher human needs, recognition of the school as a community resource, and improved technology.

The planning of auxiliary spaces must involve careful consideration of the future adequacy of the spaces for, while additional classrooms can be appended with some ease, the expansion of auxiliary spaces can seldom be accomplished easily after completion of initial construction. Thus, when auxiliary facilities become obsolete and inefficient, the usefulness of the entire facility may be diminished.

This Unit will consider basic environmental requirements for the following auxiliary spaces:

- Auditoriums
- Food Preparation, Service, and Dining Facilities
- Student Commons
- Faculty Facilities
- Offices for Administrative Personnel
- Guidance and Counseling Center
- Health Office

MULTI-PURPOSE SPACES

Before discussing general requirements for auxiliary spaces, some mention should be made of spaces that are designed to serve a variety of functions; rooms that serve as combination auditorium-theatres, auditorium-gymnasiums, cafeteria-gymnasium-auditoriums, and so on. In planning auxiliary spaces that are adaptable to multiple use, the basic functions of the spaces must first be determined. Sharing of a space by unrelated functions may result in reduced area, extended use, and lower school construction and operation costs. However, special care must be taken in designing areas of multiple use since the shape, size, acoustics and other environmental factors desirable for one use may be entirely impractical for another. Multi-purpose spaces, while they are possible, are therefore seldom better because of the compromises to which they are subject. Their functionality may be so reduced that they do not serve any of the planned uses as well as separate facilities.

In addition, multi-purpose spaces may encounter scheduling difficulties. Frequent shifting of furniture and equipment is another drawback. The cost of extra storage spaces of special equipment, such as operable partitions needed to achieve satisfactory multi-use, may cancel expected savings.

Multi-purpose spaces should be cautiously and thoughtfully planned with the full recognition that they may have serious deficiencies affecting one or more of the uses to which they will be put.

AUDITORIUMS

Designing an auditorium is an effort that requires considerable technical expertise. Designing a good school auditorium requires not only technical proficiency, but considerable imagination and luck as well. The difficulty is that school auditoriums must serve many functions that have dissimilar environmental requirements. For instance, acoustics and stage space that suit instrumental and vocal concerts are inappropriate for dramatic productions. Therefore, it is not unusual to find a school auditorium that has been designed to serve one purpose and operates to the complete disadvantage of other or that has been designed to handle a variety of functions and supports none of them well.

In spite of this grim predicament, it is possible to design a satisfactory assembly-performance-lecture hall if use is made of theatrical and acoustical consultants, if the architect has had prior, successful experience with

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auditoriums, and if expectations of the facility are reasonable and are specified in advance. Another factor that will assist the design of a functional auditorium is the elimination of all requirements related to dramatic productions. A small laboratory theatre that will provide an intimate, serviceable space for dramatic productions can be located elsewhere in the educational facility. (See Unit G)

Although this section cannot outline all the environmental and technical requirements of auditoriums and theatres, it will attempt to provide some basic information about these spaces, namely types of auditoriums and audience-performer relationships, types of seating, acoustics, capacity, and divisibility.

Four basic types of stage area are possible in auditoriums. Each creates a distinct audience-performer relationship.

The *arena stage* has audience seating surrounding the performance area. Acoustically it is unsuitable for music because of poor instrumental balance. Visually it is unsuitable for films and lectures because of poor sight lines Dramatic productions can, however, use this style space to advantage.

The *thrust stage*, in which the audience is seated on three sides of the performance area, has drawbacks similar to those stated for the arena stage.

The *proscenium* separates the auditorium and stage spaces. Essentially, the audience is seated in one room and the stage is located in another room behind the proscenium frame. Because of the high stage house needed for rigging and flown scenery, and because of the soft, sound-absorbing curtains, the proscenium stage is usually acoustically inappropriate for musical concerts. Expensive concert shells must often be utilized to make the space suitable for music. In terms of equipment, an auditorium with a proscenium stage is very costly.

An *open stage*, which unites performance and audience spaces within one room and locates audience seating on only one side of the performance space, is the most flexible arrangement for lectures, concerts, and theatrical productions. Walls, ceiling and floor can be designed so that the need for a concert shell is reduced. Required back stage equipment is not so elaborate as that needed for the proscenium stage.

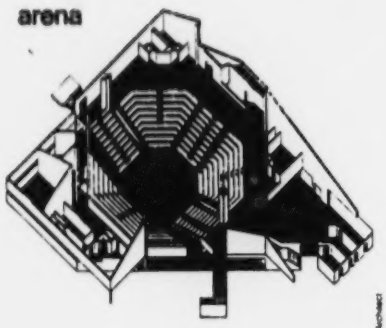
In all cases, regardless of the type of stage plan, acoustical and theatrical technicians should be consulted and should be allowed to contribute to the design of these spaces.

The stage floor should be yellow pine, tongue and groove, laid on sleepers and resilient pads. A dark surface is desirable. Back-stage requirements, especially if the auditorium is to be used for dramatic productions, will include space, electrical circuitry, and plumbing for a scene construction shop and storage. There must be adequate space both to the sides of the performance area (the wings) and behind the performance area (upstage). A receiving dock and entrance should be provided.

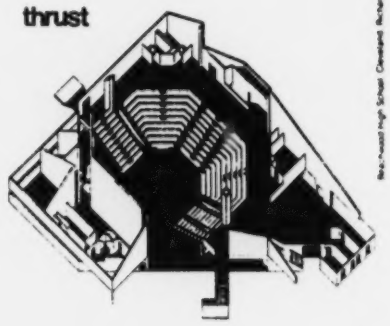
Lighting equipment is a highly specialized and technical area that should be explored with the assistance of a professional designer or consultant. Accommodations for projection equipment, either rear or frontal, and a public address system are other considerations involved in auditoriums.

The capacity of the school auditorium should be thoughtfully calculated in view of projected use of the space and availability of alternate spaces for large assemblies. The provision of seating for massive crowds is ordinarily of dubious value. Not only are large auditoriums expensive in terms of seating and space, but they also can be plagued by acoustical problems, lack of intimacy in the audience performer relationship, and poor sight lines.

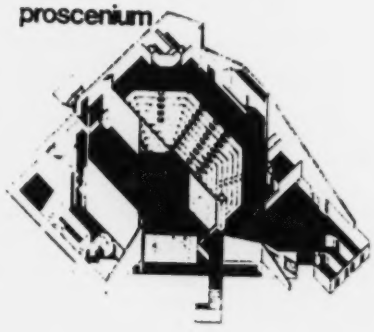
arena



thrust



proscenium



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Audience seating can assume two basic forms. Continental seating employs unbroken rows of seats. Conventional seating has one or more interior aisles. When continental seating is used, the measurement between the back of seats in one row and the back of seats in the next is slightly larger to accommodate movement between rows.

Divisible auditoriums have suffered a fall from favor because of the near impossibility of creating optimal spaces through the use of partions that, however costly and skillfully designed, never create complete aural isolation and are often accompanied by visual and acoustical drawbacks. Divisibility often results in the construction of auditorium spaces that are unnecessarily large. Regular classrooms can provide a comparable environment at less cost than these arrangements.

As mentioned before, acoustical demands of music are quite different from those of speech. Quite simply, music requires a longer reverberation time. Various commercial devices (concert shells, reflectors) are available to improve a less than ideal acoustical situation and to enhance musical performances.

FOOD PREPARATION AND DINING FACILITIES

The planning of facilities for food preparation, service and dining is best accomplished by a cooperative effort among the food service administrator, the architect, and an equipment supplier. A food service consultant also may be hired to assist with the process. The objectives are (1) to provide an efficient and healthful working environment and (2) to provide a pleasant dining environment.

A basic facility will include spaces for the following activities: receiving, storage, cooking, serving, dining, dishwashing. Office space for the administrator and locker and toilet facilities for the kitchen staff also may be required. These spaces should be arranged in such a manner that persons, food, and supplies can move or be moved conveniently from one space to another in a logical progression. The maintenance of health and safety standards is obviously imperative, and the facility should be designed to promote cleanliness and easy maintenance.

General requirements for spaces mentioned aboved are as follows:

Receiving Area: The receiving dock should permit easy unloading of supplies and food onto a roofed platform. This area should be located away from student traffic. The floor level of the dock and the storage/kitchen areas should be the same.

Storage: Storage for food items that do not require refrigeration should be adjacent to the receiving area and convenient to the kitchen. This area should be dry and clean. Storage space for non-food items should be convenient to the receiving area and the dishwashing/maintenance areas. This space should be well-ventilated and may contain a sink with hot and cold water.

Kitchen: The type of kitchen planned will depend on the nature of the food service program. Is the food to be prepared on site or will it be delivered from a central kitchen? What type of food will be served — hot meals, convenient pre-packaged foods, vended items? The size of the kitchen will depend on the nature of the equipment and the number of people required to prepare meals. Food preparation equipment is expensive, and it should be chosen with care before the kitchen can be designed. Refrigerators and freezers for food storage — if required by the program — must be planned for and accommodated.

Service: Food service may occur in a section of the kitchen, in a separate room, or in the dining area. The space needed, the equipment required and the arrangement of service counters will be determined by

SPATIAL RELATIONSHIPS
DINING FACILITIES

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the food preparation/service program. The objectives here are to facilitate an attractive display, easy selection, and quick service of food. Efficiency is vital: persons should not have to endure long waits in lunch lines.

Dishwashing: The dishwashing and maintenance area should be located adjacent to the dining room, preferably near its exit. Equipment selected for cleaning dishes and utensils will determine the size of the space. Garbage and trash disposal also should be accommodated in this area.

Office: Enclosed office(s) for the head cook and/or administrator will be needed to accommodate menu-preparation, purchasing, and other tasks related to the management and supervision of the kitchen. The office should have a window providing a view of the kitchen and serving areas.

Staff Facilities: The kitchen staff should have conveniently located locker, lavatory and toilet areas.

Dining: The planning of the dining areas will require careful consideration of spatial requirements. The number of persons to be accommodated, the seating arrangement, and the type of furniture to be purchased are some considerations that affect size. If there is only one lunch period, the space must be larger than if students dine in shifts. The dining area should be properly illuminated and ventilated; it should be treated for noise control; it should be cheerful and clean; it should be durable and easily maintained. Care should be taken to provide an attractive and comfortable environment.

At all school levels, the dining area may sometimes serve as an auditorium, a ballroom, a registration area, and a large-group classroom. Multi-use of the space calls for extra attention to acoustics and design. For instance, load-bearing columns down the center of the room, while not a hindrance to dining, may preclude use of the area for assemblies by ruining sight lines. Alternative and additional uses should therefore be anticipated and planned for well in advance.

It should be noted that the type of food service program operated by the school will depend on the location of the school and the ease with which deliveries can be made. Site therefore influences the type of kitchen facility that will be needed and the type of equipment that must be purchased. Thus, if a school is in a rural area, daily deliveries from a central kitchen may be impractical, and a fully equipped, independent kitchen may be a necessity. Also, a remote location may call for the installation of large freezers for the storage of food that would not be necessary in a suburban school to which deliveries could be quickly and easily made.

If the preparation and packaging of food is done at a remote location outside the immediate school, the elaborate cooking, service and clean-up facilities described above are superfluous. When such service is implemented, students can obtain their lunches from a counter or service table and, if trays, plates, etc. are disposable, the entire package can be discarded, eliminating the need for dishwashing equipment and staff. The installation of vending machines also may simplify the nature of other food service facilities.

STUDENT COMMONS

The student commons is a central location in the school where students can congregate for relaxation, conversation, committee meetings, study, and snacks. Its purpose is to nurture social and personal as well as academic advancement and to provide for student-teacher interchange in an informal atmosphere. Because students require association with their peers in out-of-classroom situations and because much of what students

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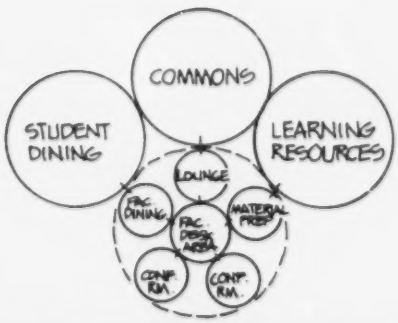
learn comes from mingling informally with one another and with faculty, the commons fulfills very basic needs.

Although the student commons should be centrally located — perhaps in conjunction with a library, auditorium or dining area — it also should be somewhat secluded. It should always be available for use and furnished as a place for informal study and socializing. Snacking facilities may be incorporated within or adjacent to the area. With modular scheduling operating in many high schools, the study/lounge student commons is essential because it provides a place for the students to go during their unscheduled time. It provides a social environment that the formal learning resources center does not. It exists as an option for students, an alternative environment.

The commons should be furnished with study tables and chairs for small groups, as well as lounge-type seating. The atmosphere should be inviting. Students probably can create an environment for themselves in this area, and they should at least be able to express their preferences in decoration of the space. Besides food vending machines, the area may include telephones and typewriters.

Multi-purpose rooms are programmed areas and they allow little opportunity for casual student association on a consistent basis because of the regular changes to which they are subject. It is very important that the student commons not be a multi-purpose room. The commons is students' space and it should not be periodically changed as tables and chairs are introduced, removed, or rearranged to support a variety of functions.



SPATIAL RELATIONSHIPS
FACULTY SPACES

FACULTY FUNCTIONS

Spaces for out-of-classroom use by faculty members are required for preparation of teaching/learning materials, conferences, and for relaxation. If it is determined that the faculty will dine separately from the students, then dining facilities are another need that should be considered.

The type of space provided for teachers' use in planning and developing materials will depend on the general nature of the facility. If classrooms are enclosed and a teacher is scheduled to work in one space all day, then the classroom serves as an individual office and can be used for much preparatory work. This arrangement does not preclude the need for a separate, common facility where teachers have access to materials, machinery, and space with which to create instructional materials. When teachers move from one learning space to another during the day, there is an obvious need for private work and storage space, which can be used for preparing lessons, resource materials and displays, interviewing students and parents, evaluating student work, and so on.

A space that serves this function can assume a variety of forms. It can be a central work area with individual desks for all teachers — located near a central depository for supplies and equipment. Proximity to the learning resources/media center may be desirable. Another possibility is the grouping of teachers' desks and work spaces in departmental offices. Whatever the solution, the location of the teacher preparation/office areas should be near learning spaces to allow convenient access for both student and teachers. Small, private rooms should be planned for interviews with students and/or parents when no other space exists for confidential or uninterrupted conversation.

A variety of arrangements is possible for the accommodation of refreshment breaks, rest, and socialization for faculty members. It is generally conceded that the faculty needs informal gathering space away from student traffic. There is merit, however, to locating such private spaces near student commons to allow informal student-faculty association. Like the student commons, the faculty lounge should be informal and always available. It should not do double duty as a meeting room for teachers, for dele-

gations calling on the principal, for PTO committee meetings or other functions that would convert the space into a multi-purpose room. The faculty lounge should be furnished with comfortable seating as well as tables and chairs. Carpeting and other amenities that will enhance the attractiveness of the space are equally desirable. It may be convenient to locate faculty toilets adjacent to the lounge.

If separate faculty dining facilities are to be provided, it is possible to combine the lounge and dining facilities. If this solution is chosen, the faculty lounge must be placed in close proximity to the main food service/dining area. This dual use will introduce new area and furniture requirements.

OFFICES FOR ADMINISTRATIVE PERSONNEL

The number and nature of offices for the school's administration and for special services personnel will depend on the type of facility, size of the enrollment, the kind of special services provided, and the extent of community use of the facility. In spite of these variables, the general administrative suite is ordinarily located near the main entrance of the school. Regardless of design, whether open or contained, it should incorporate a public reception/waiting area, desk and work space for the school's secretarial staff, mail boxes for teachers, the control panel for an intercommunication system, the control panel for signal and tone system, a master clock and controls, and the telephone switchboard. Provision should be made within this general area for storage of administrative supplies, school records, duplicating and other office machinery, and perhaps instructional materials if they are not kept elsewhere.

The office of the school's principal should be located adjacent to the main reception/information area. It should be large enough to contain a desk and chair, seating for three or four persons, bookcases, and cabinets for storage. The principal's office should be accessible to the secretary. It should be private — both sound-proof and without interior windows. A comfortable and pleasant atmosphere is important.

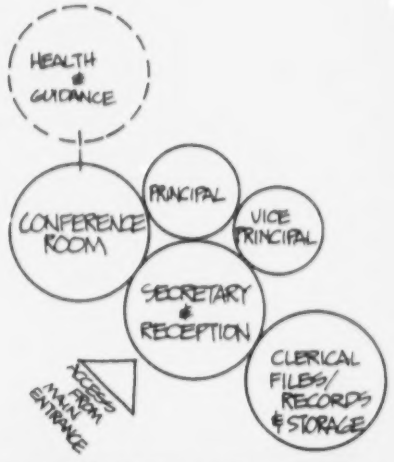
It may be desirable to locate a conference area adjacent to the administrative offices. Furnished with typical conference style table and chairs, this room can be used by the school staff.

The arrangement of the administrative offices requires attention to tasks to be performed and the relationships of persons performing them, accessibility to students, teachers, and community visitors, convenience of stored materials, and ease of traffic flow. Attention to interior design and decoration is particularly significant since this is a central school area and an impression of the total facility may be formed here.

Staff offices that may be located in conjunction with the main administrative office are those of the school nurse, guidance counselor, and psychologist. Proximity to the main administrative area will facilitate communication and allow access to records. However, entrance to these areas should not be through the administrative offices. Each special service should have its own distinct entrance and its location should be clearly identified.

GUIDANCE AND COUNSELING OFFICES

Guidance offices should be separate from the administrative office and should contain at least two main areas: an informal display/reading/waiting room and a staff office(s). A storage/display area for occupational and educational information — college catalogues, vocational material, study guides — should be furnished with tables, chairs and comfortable lounge-type furniture. Books, pamphlets, films, and slides for students' use should be easily accessible. Shelving, display racks and cabinets should



ADMINISTRATIVE SUITE
PRIMARY SCHOOL

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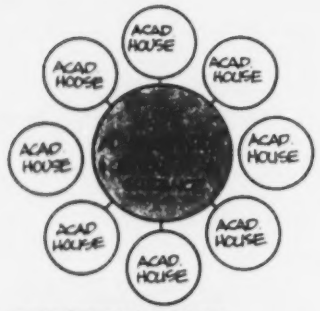


CENTRALIZED GUIDANCE CONCEPT

DECENTRALIZED GUIDANCE CONCEPT

allow well-organized, highly visible arrangement of these materials. Tackboard should be provided. This space should be conveniently located and attractive so that students will be encouraged to use it.

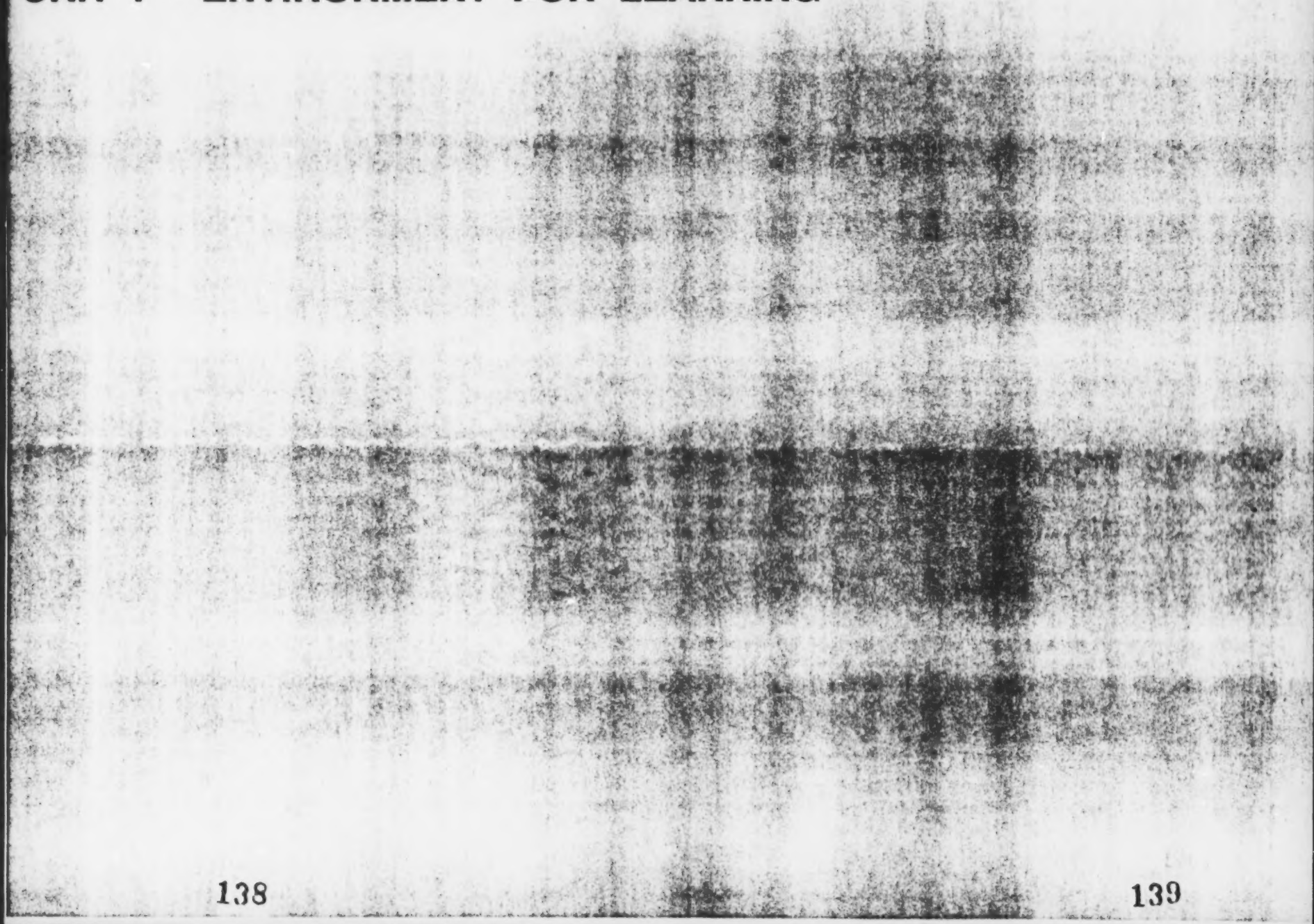
Also needed in the guidance/counseling area is a room (or rooms, depending on the size of the staff) that will serve as the counselor's office and conference room. This area should be private — visually and aurally isolated — and should provide a relaxed, informal atmosphere. In addition to a desk and other office furniture for the counselor, this room should contain seating for two or three other persons.

Other possible components of the counseling area are a small room(s) for private testing and interviewing. If a psychologist is on the school staff or if professional therapists are rotated among schools in the administrative unit, it is essential that a room be provided for meetings between these persons and students utilizing their services. Again, institutionality should be avoided in the design and decoration of these spaces.

HEALTH CENTER

The health center should be large enough to accommodate beds for ill students, space for first aid treatment and an office for the school nurse that can contain a desk, filing cabinets for students' medical records and a storage for instructional materials. Dimensions of the health center should be such that there is space for testing — students should be able to get an appropriate distance from the vision test chart, for instance. Plumbing for a sink would be included in the design. A bathroom should be located adjacent to the health center. Electrical wiring for equipment must be considered. A telephone and a refrigerator probably will be necessary. Fixtures for suspended screening may be desirable.

Obviously, if the school health center is to be used as a community health clinic, its physical and spatial requirements will increase in complexity and number. Access from outside the building, waiting rooms, examination rooms, laboratory space and a physician's office, as well as equipment and furniture for these areas will need to be considered.



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THE ENVIRONMENT FOR LEARNING

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THE ENVIRONMENT FOR LEARNING

Clearly the school environment affects learning. Yet the important relationship between the physical conditions and the learning process seems to be given only modest consideration by educators and facility planners. The implications of this circumstance, though often unrecognized, are many.

It is becoming apparent that this nation, and perhaps others, suffers from a crisis in human dignity. The lack of respect for dignified behavior seems to have developed as the norm in society. Do undesirable and degrading environmental conditions provided to the young in our schools produce adults that lack feeling for higher level humaneness?

For example, the lack of toilet tissue in the restrooms of a large urban district is labeled in a newspaper editorial a source of humiliation to and demoralization of students. The interim superintendent of schools pledges to create an educational climate that will correct this problem. The environment for learning is often associated with elaborate structural designs of school buildings. Although design is important, many subtle aspects of environment need also to be given emphasis.

Society's current lack of concern about the physical environment may lead to a realization that the environment in educational settings can indeed be destructive of human dignity. Environmental changes could instill in students an appreciation for environmental beauty. Also facility should instill in students a desire to be more protective of a quality environment. The challenge is increasingly evident.

The educational reform movement centering on improved education for the 21st Century provides an opportunity to emphasize that environment influences behavior. A thoughtful well designed educational setting is a major contributor to the development of appropriate behavior among students. It is therefore incumbent upon all who are involved in planning educational facilities, as well as those who use those facilities, to provide quality space for learning.

The material presented here discusses the nature of educational environment, the effect of environment on learning, the need for collaborative effort to create desirable learning environments, and the importance of several physical attributes of educational environment.

THE NATURE OF ENVIRONMENT

There are many definitions of environments. Perhaps that is why its importance is not well understood. For the facility planner and the educator, a learning environment consists of those variables construed not to be a direct part of the teaching/learning process but surround that process in a highly pervasive manner. For example, it is well understood that the amount of quality and the lighting in the classroom is an environmental condition that effects student performance. Less thought is given, however, to the way a planter of greenery located in the commons area of the school effects behavior. A complete absence of illumination would render the space useless for acquiring the type of learning generally thought to be the province of the school. On the other hand, space completely devoid of color or beauty would likewise be useless for the development of a student's human growth and over a period of time could be destructive.

It is helpful to consider three types of environment: (1) physical, (2) social, and (3) institutional.

Generally one can view the **physical environment** as non-human. Architects categorize physical environment as either natural or built. Trees, topography, and waterways on the school site prior to site development constitute the natural environment. Public

parks endeavor to maintain and utilize those natural features to a greater extent than in the development of school sites. Yet a quality site will usually possess many natural features. In contrast the built environment is artificially created. Therefore, the physical structure, along with the site development, make-up the school's built environment.

The **social environment** exists as soon as the new school is occupied and it prevails, though continuously changing, during the use of the building. The people component in a school is usually referred to as creating and comprising the socio-psychological climate. The relationships between and among students, teachers, staff and parents are regarded as highly important to learning. It can be sensed often by spending only a short period of time within a school. For many educators, this type of environment is construed to be a major factor in learning. This view has tended to shortchange the importance of the physical setting for learning. Applications of social and behavior factors in the design of the physical environment, however, can enhance and encourage the social environment.

The **institutional environment** is created by the organization (school) itself. Laws, rules, and operational norms impact a school in important ways and constitute an environmental influence. Teachers and students have come to understand that going "up the down staircase" can create operational havoc in an otherwise smoothly functioning educational setting. Likewise the removal or relocation of furniture in the teachers' lounge can cause a major disturbance affecting the previous daily routine.

Of these three types of environment, facility planning places the most relevance on the physical. It is apparent that renovation and new construction of school buildings greatly impact physical characteristics. It is also obvious that the three types of environment are overlapping and dynamic. None of the three exists in a vacuum, and each is dependent on the other two. The discussion presented here about the physical acknowledges the other types of environments as also always being important to learning.

EFFECTS ON BEHAVIOR/ LEARNING

Educators have not been in the forefront of research dealing with the relationship between behavior and environment. Despite work by psychologists, especially in hospitals, the study of environmental effect seems to have had relatively modest influence on school design. The considerable emphasis in education on measurable results has led to a widespread belief that proven learning, as reflected in test scores, is the only basis upon which environment can be shown to affect learning. The provision for school buildings has over the years been justified to parents, school boards, and taxpayers primarily as a matter of having sufficient classrooms and space to accommodate teachers and students. This seems to suggest that all that is needed for good education is enough square footage to enable the teacher to teach. Consequently, the environment mistakenly became a little regarded factor in the learning process.

During the period 1950 to the present, there has evolved a growing body of literature that suggests a much stronger relationship. Edward T. Hall has examined the provision for space in the environment in terms of three categories: fixed-featured space, semifixed-feature space, and informal space. The fixed feature of space is determined by how constant the boundaries are, i.e., the extent to which behavior results from the space that is unchangeable. When the use of space results from the arrangement of movable objects, it is said to be the result of semifixed space. Informal space is that which permits a significant amount of adaptation depending on the wants and needs of its users.

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> Everything man does is associated with the experience of space. Nothing occurs... without a spatial context.
>
> Edward T. Hall

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The extent to which space can be identified in these three terms was demonstrated in the studies by Osmund and Sommer. "Sociofugal" is the label applied to design that prevents or discourages desirable relationships. Research on seating arrangements permitted the measure of differences in the degree of interpersonal contacts among the individuals resulting from back to back, face to face, and right angle seating assignments. The strongest relationship resulted from the 90 degree placement as in corner seating at a table. Such improved potential for strong relationships resulting from spatial arrangements is called "Sociopetal," or that environment which aids communication and the strengthening of relationships. Open space design of school buildings represent this type.

The work of Robert Barker led to analysis of "behavior settings" as an aspect of environment. The acceptance of the premise that environment does affect behavior presents a fundamental ingredient for environmental design. If the type of desired behavior (learning) is known and the physical environment that will cause or contribute to that behavior can be determined, a behavior setting is identified. An example of this was recently noted by the writer. School corridors are typically noisy areas of the building. The behavior desired is a decrease of boisterousness by the students. At one school the corridor lights were automatically dimmed while classes were in session. Any student permitted in the halls during class time was automatically subdued psychologically by the low light level. The creation of another behavioral setting evolved with a large group of students kept in a school cafeteria while waiting for buses. When the overhead lights were in part turned off an immediate hush would come over the group. Situations such as these support the belief of Warren Hathaway who seriously doubts the environment is neutral. He contends it has much more effect on learning that has been previously thought.

COLLABORATIVE EFFORTS NEEDED

The creation of a desirable learning environment is a complex process. The task of designing the physical structure has been the responsibility of the professional architect trained to provide that appropriate service. Having been informed of the function to take place in the space, it is the province of the architect to translate the educational needs into a physical facility. He has been taught that "Form follows function." In the school setting, function is often interpreted as teaching methodology. A more accurate assessment of spatial arrangements might be based on the human behaviors desired for those who will be using the space. With this perspective the basis for design might be:

Desired Behavior → Function → Form

If maximum learning is to occur within the educational setting, more collaboration between and users and planners is essential. The collaborative process needed to create the best possible environment for learning might be viewed with these relationships:

Although this involvement also relates to the development of educational specifications as outlined in Unit E, it should be noted that consideration of environment is a first step in the total planning process.

An example of a broad scale collaboration on the study of learning environments is the Interface Project initiated at Texas A&M University in 1987. Two groups of professionals comprised of university faculty, architects, facility planners, public school administrators, and state department of education staff met in a one day seminar to determine building char-

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acteristics with potential to affect learning. The study under the National Interface Task Force has as its major function the increasing of awareness that the physical environment is an important aspect of learning. It is apparent that, with education gaining recognition at local, state and national levels facility planning will need input from a wider range of interested and concerned individuals than in the past, if environments are to be created to fully maximize student learning.

ENVIRONMENTAL FEATURES WITH POTENTIAL TO ENHANCE LEARNING

The Interface Project identified building features supportive of quality education. Observations in exemplary schools in the United States and Japan provided examples of how the facility can contribute to learning. The examples cited here are environmental features arranged in the categories developed by the National Interface Task Force.

Reflecting the Community

- Quality facilities permitting the development of pride by all in the community
- Structural designs committed to community utilization both recreational and instructional
- Dedicated space in a building for parental use, e.g., parent-teacher groups
- Space designed to present the community values on a continual basis

Adapting to users' needs

- A range of illumination consistent with task
- Ample storage nearby to learning
- Availability of fixed, semifixed, and informal space in every learning area
- Flexible wall arrangements provided for variation in learning

Permitting teachers to be professional

- Controls for heating, lighting, and air conditioning available to each staff member
- Teacher work areas equipped with telephone, computer, professional materials and furnishings to encourage professional dialogue
- Preparation space (other than classroom) for every teacher
- Quality conditions that reflect a high priority for education
- Space available on a daily basis for teachers to assemble, converse, and coordinate learning activities

Fostering communication

- State of the art provision for existing and future technology
- Walls in every learning area that are "learning surface" using geographic materials, murals, and displays
- A degree of "openess" that disseminates information about all learning activities
- A foyer that communicates the philosophy and importance of learning
- Telephone services available to all users of the building
- Some portions of the physical structure sufficiently open to permit students to appreciate the "inner works"

Creating a positive behavior setting

- Provision for plants, shrubbery, and flowers, including informal interior and exterior space for which students can be responsible

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- Space throughout the building that permits students and teachers to conduct informal dialogue
- Sufficient corridor and classroom space to avoid crowding
- Use of color consistent with desired psychological impact i.e., cool or warm
- Facilities for handwashing etc. in corridor alcoves rather than in restrooms
- Arrangement for individuals (students and teachers) to withdraw temporarily from the total mass

Accommodating learning styles

- A variety of space for hands-on learning in every content field
- Arrangements for student groups for both assigned and informal student activities
- Places for students to do individual work rather than at a desk
- Sufficient space and furniture arrangements to permit teachers to carry out one-on-one consultation
- Space for a variety of teaching methods

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ENVIRONMENTAL CONSIDERATIONS:

COLOR

It has been suggested that color plays an important part in the way we act in our environment. However, limited research has been conducted on color as it relates to learning. Color experts do feel that the warm colors (red, orange, yellow, pink) tend to stimulate us into action, while the cool colors (blue, green, gray) tend to relax us. Therefore it is important to select a color appropriate to the activities of a given learning area. One consideration is that colors may affect students differently at different age levels and in different learning activities. For example, colors used effectively in a media center at the primary level may not be appropriate at the secondary level. The type of lighting used may also affect color in subtle ways, so the relationship between lighting and color should always be considered.

For any given color these is an associted effect. Color may be used to create feelings of warmth, coolness, dimension, size and distance. School planners should recognize the impact of color and how it can influence the attitudes of users of the school environment. Color, properly used, is an important contribution to an improved learning environment.

LIGHT

Since vision plays a major role in the communication of knowledge, conditions that allow adequate visibility should be provided in educational facilities. A good visual environment permits fast, accurate and comfortable vision. Level of illumination is not the sole factor responsible for producing these conditions. Balanced brightness in the environment and the elimination of glare also contribute to visual accuracy and comfort.

This section explores general principles related to lighting that have evolved out of research and experience, practical application of these principles in terms of luminaires and environmental treatment, and the implications of responsible energy use for school illumination.

Illumination level. Sufficient light should be provided to permit the performance of a viual task taking into account its size, configuration, contrast of object and background, and distance from the viewer. Illumination is measured in footcandles. A higher level of illumination in terms of footcandles does not guarantee that a luminaire is more effective than one with less output. Efficiency of a luminaire is measured in terms of Equivalent Sphere Illuminance; ESI is a measure of glare-free illumination. Lighting systems of 90 to 100 footcandles light equal only 20 footcandles of glare-free light when evaluated with a field task photometer. The achievement of a high ESI is the objective of all lighting systems. A lighting system that merely produces a high level of illumination may be totally inadequate, even damanging, because of glare or low contrast due to veiling reflectances. In addition, energy is wasted in producing inefficient fottcandles. The level of illumination required to insure visual accuracy depends on the nature of the task. For instance, in a test case a task in pencil handwriting required 63 footcandles to provide the same visual accuracy as a task in ink handwriting under 1.4 footcandles. The difference in required footcandles was due to the low contrast between grey pencil lines and writing paper as compared to black ink line on paper.

Pencil handwriting is recognized as the most difficult common seeing task in schools and therefore it has been used as the basis for most lighting recommendations. The recommendation that 63 footcandles of glare-free illumination be provided for optimum seeing conditions has recently been criticized because the test case on which it was based was an extreme one. The level of illumination re-

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RECOMMENDED ILLUMINANCES

Classroom	500 LUX
Drafting & Graphics	500 LUX
Laboratories	500 LUX
Library Reading	500 LUX
Offices	500 LUX
Shop Area	500 LUX
Typing Rooms	500 LUX
Auditoriums	250 LUX
Cafeteria	250 LUX
Gymnasium	250 LUX
Library Stacks	250 LUX
Washrooms	250 LUX
Corridors	250 LUX
Mechanical Rooms	250 LUX
Storage Areas	100 LUX

* Based on the report "Lighting for Education," Ontario Ministry of Education, 1981

quired to perform this task may be unnecessary for the perception of other objects with higher contrast. Some authorities reject not only the recommendation, but suggest that alternative writing instruments (black felt-tip pens, for example, which produce high contrast marks on white paper) be utilized in schools and thereby obviate the need for higher illumination levels. Now that energy is an important concern, the 63 footcandles recommendation has encountered additional questioning. It has been noted that students in countries other than the United States with lower lighting level standards seem to learn as well with no greater frequency of eye problems.

Brightness ratios. Brightness may be defined as the amount of light emitted from a light source or reflected from a surface per unit of area.

When the eye fixes on a task, the eye adaptation level is established based upon the task and surrounding brightness. When the point of regard shifts to another area, such as a window or chalkboard, the eye automatically adapts to a new brightness level. When brightness differences are nominal, adaptation is not a problem. However, if brightness differences are large, more time and energy are required for adaptation. For optimal visual efficiency, the brightness of the tasks should be equal to or slightly greater than that of its immediate surroundings. It is important to become aware of the changing tasks in educational facilities that now must be looked at, such as computer usage.

Brightness balance. The following guidelines have been recommended to achieve brightness balance:

1. No large areas should have a brightness less than one-third the task brightness.

2. No area adjacent to the task should be brighter than three times the brightness of the task.

3. No area in the visual environment should be brighter than five times the brightness of the task.

The implication of these guildelines is that learning spaces should be designed so that light from windows and luminaires does not exceed the adaptation level of the human eye. Intensity of light is not the sole issue here; the way light is directed and reflected affects brightness levels and balance.

The type of luminaire also affects brightness balance. For instance, pendant and surface-mounted luminaires can provide light on the ceiling and thereby reduce the brightness difference between ceiling and luminaires. Suspended direct-indirect fixtures project a relatively small portion of light downward and a large part upward. Care must be used in providing adequate mounting height for indirect fixtures to insure an even light spread. If these fixtures are too close to the ceiling, there is a possiblity of excessive brightness on the ceiling immediately above the luminaire with low brightness between the luminaires. Large area luminous ceilings provide uniform illuminiation with low brightness. The luminous area should, however, be extended to the edges of the ceiling so that corners and walls will have adequate light.

Brightness control largely depends on the size of the luminaire. Narrow luminaires of recessed or surface-mounted type are usually brighter than wide units. The lens or diffuser, the number of lamps per luminaire, and the output of the lamps are all basic factors in luminaire brightness. The final choice of size, type, and number of lamps per luminaire will depend on the desired level of illumination, the module size selected for space division, the brightness characteristics of the luminaire, and the efficiency of the total installation.

Uniformity can be obtained by placing luminaires around the periphery as well as at the center of a ceiling. This layout, when properly designed, increases wall brightness and improves

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birghtness balance and visibility on chalk and tackboard surfaces.

Although there has been a trend to reduce window areas in classrooms (this is especially true in open space schools where reliance on mechanical systems of all types in necessary), energy economy demands that the drain on fuel resources be held down. Use of sunlight generally will be less expensive than artificial light except in extemely hot or extremely cold climates where air conditioning and heating costs may change the balance. Undesirable brightness can be controlled with tinted glass, operable shielding devices and landscaping techniques.

In spite of the necessity for brightness balance, a degree of variety in the illumination of the school environment is desirable. Unmitigated high brightness has proved to be distressing for most people and should certainly be avoided. The objective is to achieve a degree of regularity that avoids high brightness contrast and conforms to the recommendations listed above. Achieving this delicate balance is not a task for the inexperienced.

Reflectance. Every object reflects some portion of the light it receives. The percentage reflected is known as reflectance. Reflectance of surfaces in the school environment is a significant factor in the design of a successful lighting system. Color and texture of a material affect its reflectance. Light colors and glossy finishes have a higher relectance than dark colors and rough finishes. Therefore, for brightness balance suitable for reading and writing, careful attention should be paid to the colors and textures of walls, floors and funiture.

Painting the ceiling and upper side walls white is an efficient use of light. Where the luminaires direct most of the light downward, as in typical recessed systems, the brightness of the upper walls and ceiling depends entirely on light reflected from the lower walls, floor and furniture. In such installations, the ceiling will look dark unless the floor reflectance is higher than normal. A dark carpet may be a poor choice with a lighting system of this type. Chalkboards should have a reflectance of at least 25 to 30 percent. If a dark-colored chalkboard is large enough to affect adaptation, suppplementary light must be provided to bring the brightness to at least one-third task brightness. This adjustment also will increase the visibility of material on the board. Tackboards adjacent to chalkboards should have similar reflectance values.

Contrast rendition and veiling reflections. It has been found that overhead lighting with a heavy downward component causes a serious loss of visibility due to veiling reflections. This phenomemon, which causes a loss in contrast, is produced by the reflection of light from the lines and surfaces that make up the task. Surfaces with high gloss finishes will have more veiling reflections and thus are subject to higher contrast loss than are matte finishes. Reduction of downward components and introduction of light from ceiling and wall areas at an angle to the task create a uniformly light hemisphere over the task, which is ideal. Large areas of low brightness are therefore more desirable than small areas of high brightness. Ceilings and side walls should have high reflectance and light should be directed toward these surfaces to improve the brightness balance and contrast rendition in the task. Wall brightness is particularly important so that all the light on the task does not come from overhead, producing veiling reflection.

Correction of veiling reflections and the consequent loss of contrast can be accomplished by a qualitative change in the lighting system — in other words, redirect, rearrange and redesign the light sources. Another approach, which is expensive in terms of long-range energy consumption, is to increase the illumination level. To compensate for each one percent

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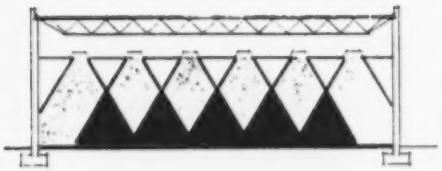

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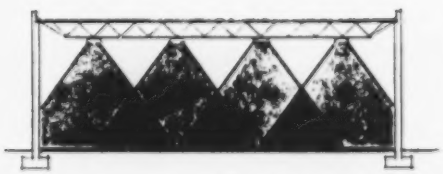

Courtesy Rowe-Holmes Assoc Architects

contrast loss requires a 15 percent increase in the illumination level. This figure is an indisputable argument for thoughtful, knowledgeable lighting design.

School lighting and flexibility. School lighting systems must be flexible. illumination must be responsive to the needs of various program activities, to changing spaces, and to a broader range in the age of the users.

The current expanding use of audio-visual learning aids such as computers, teaching machines, television and film projectors poses a new set orfrequirements in school lighting. Not only must luminaires provide effective, comfortable and accurate visibility for traditional educational activities, but they must be able to accommodate use of these specialized devices.

In flexible and open space facilities, people move around and room sizes and shapes are modified. Lighting systems must be able to adjust to this fluidity of people and spaces. Obviously this adaptability requirement presents a challenging design problem.

With extended use of the school and the growth of community/school programs, the age range of school users has expanded. The necessity for accommodating persons of many ages has suggested that lighting standards based on the needs of children and younger adults should be reexamined in light of an older group of users.

Illumination and energy use. As was mentioned earlier, not all lighting systems use energy efficiently. Poorly designed systems may overlight an enviroment or may create inadequate levels of glare-free illumination relative to energy consumed. it has been demonstrated that only 6 percent of the energy by typical illuminating systems is converted into useful light for comfortable, efficient seeing. The rest often becomes heat that is costly to eliminate.

A primary obligation of the planner is to encourage the use of illuminating systems that are both effective and efficient. Responsible energy use can be encouraged by insistence on proper reflectances and finishes of major interior surfaces and furnishings, intelligently designed switching patterns, flourescent lamps that use less energy than filament lamps for equal ouput, heat transfer luminaires and the turning off of unneeeded lights. Some educational systems are starting to install computerized energy systems to make sure lighting is used efficiently.

Lighting and aesthetics. Lighting does much more than make objects visible — it is largely responsible for the ambience of a room. No attempt by students and teachers to create a warm, confortable, pleasing environement will prevail against the relentless brilliance of bare flourescent tubes. It is imperative that effective, economical and energy-conscious lighting be provided that is also pleasing to the users. When the designers exhibit no concern for human needs, the users either suffer or devise their own relief, usually in the form of incandescent lamps in reading corners where students can occasionally enjoy a warm glow.

The choice does not have to be between aesthetics and effectiveness. A creative, intelligent lighting designer can provide both.

ACOUSTICS

Designing a good acoustical environment is an educational facility requires the solution of two problems: (1) controlling sound within a particular space so that sound that is to be heard can be heard well, and (2) preventing the intrusion of unwanted sounds from outside the space.

Acoustics are affected by the use of the space, its size and shape, its relationship to other spaces and activities, its location within the school build-

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ing, and its proximity to sound-producing objects on or adjacent to the school site (traffic noise, for instance). Planners should carefully consider each of these factors during the intial planning stages because expensive surface treatment will be needed later to compensate for oversight or poor judgment. For example, placing general learning spaces within hearing distance of food preparation or industrial arts areas will create flagrant and unnecessary conflicts that may be difficult to correct and impossible to live with.

Although the creation of a desirable acoustical situation requires the expertise of an acoustical engineer, there are some aspects of the problem with which the planner should be familiar.

Acoustical basics. Generally, sound radiates from its source in spherical, expanding waves. It travels through solid substances as well as air. The transfer of sound through a wall, for instance, is accomplished by diaphragmatic action between the two surfaces of the wall. Vibrations are carried from one surface to the other by the structural members to which the wall is attached. Upon encountering a barrier, part of the sound energy is absorbed and the remainder is reflected. The reflected sound reverberates until the sound energy is dissipated. the length of reverberation time is affected by the sound-absorbing/reflecting qualities of the surfaces of the space in which the sound originates. Hard surfaces tend to reflect sound. Soft surfaces tend to absorb sound.

Acoustical treatment attempts to enhance wanted sound and to impede unwanted sound. Its success depends on the types of materials with which a space is surfaced, the size and the shape of the space, and the quality of the barrier to reduce undesirable noise tranmitted from outside the space. The effeciveness of a barrier in accomplishing acoustical separation of spaces is influenced by its composition and air tightness. Because there is no such thing as a completely soundproof wall, door or window, such barriers only reduce intruding sound to a point of minimal interference. The intenity of the intruding sound dictates the degree of sound insulation that is necessary.

Transmission loss is that portion of an external sound that is lost in traveling through a barier such as a wall, door or window. It is usually measured in the number of decibels a sound is reduced by the transmission resistance of the barrier.

Noise reduction in a given space, while it involves transmission loss, is also affected by the area of the boundary between adjoining spaces annd the reverberant condition of the space itself.

Treatment of a room to accomplish sound absorption does not affect the original power of the sound. Instead, it prevents the sound from reflecting repeatedly or reverberating. The reverberation sound is retained in the room. The length of retention is related to the original power of the sound, the absoption, characteristics of the space, and the size of the space. Accumulating, retained sounds can create an undesirable noise factor in general learning spaces. Prolonged reverberance is also objectionable because it makes speech unintelligible and interferes with communication.

A space in which sound is reverberant is described as a live space. While a live environment is not suitable for general classroom or learning spaces, it is beneficial in other areas, for instance, music rooms.

Background noise consists of sounds originating both within and outside a given space. Coughing, footsteps, chairs scraping on floors, water moving through pipes, and the hum of ventilating systems are some components of background noise. These sounds may reach a listener through wall, doors, windows, and from adjoining spaces not separated by a barrier. Although it has been a standard goal

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in school design to reduce or eliminate all background noise and achieve a high degree of quiet, it has been found that a certain type of background noise is not undesirable. When intruding noise is general, a vague hum, it is not distracting. The level of sound, then, is to a certain extent not so important as its character. A degree of generalized background noise is actually beneficial in that it masks objectionable sounds within the space. It has been clearly deomstrated that silence is not a necessary condition of effective work, but that sounds exceeding the general tenor of background noise — like intelligible speech from another area — are distruptive.

In normal human hearing, sensitivity varies with pitch. The human ear is least perceptive of low-pitch sound and most sensitive in the middle ranges, with sensitivity tapering off and gradually disappearing as the pitch becomes higher. Obviously, a realistic approach to acoustical problems, whether the objective is the reduction of unwanted sound or the improvement of hearing perception of wanted sound, should be based on sound characteristics. Decibel levels based on sound pressure alone often are misleading. Equal decibel levels related to sound pressures are not equal levels where there are different pitches or frequencies involved. Actually, effective acoustical design must be predicated upon sound as experienced rather than upon sound as measured. The term most closely related to this viewpoint is loudness. Loudness is related to sound pressure, but it is not directly proportional to it. Loudness is a function of both sound pressure and pitch considered simultaneously.

It is from a consideration of experienced sound that solutions of acoustical problems in schools must proceed. There is not reason to intercept or reduce a sound that cannot be heard. Except at extremely high-frequency levels rarely experienced in school situations, sound does not have any direct, detrimental physical effect on human beings. Persistent, unwanted sounds, however, may be distracting and annoying, and may cause a loss of learning.

Sound is a negative influence when it hinders verbal communication and creates a need for talking loudly. Such competition may produce tension and fatique.

Acoustical objectives. The usual educational acoustical problem requires several types of corrective steps. These include: (1) use of effective sound insulation where desired, (2) creation of optimal reverberant conditions in all school activity areas, (3) elimination or reduction of sound interference from external sources, (4) reduction of unwanted sound, both in spaces where quiet is desired and in spaces through which unwanted sound may travel to quiet areas.

The objective in acoustic design is to secure the desired hearing and speaking conditions for learning at the lowest possible cost in view of such attendant circumstances as the overall building design, desired surface finishes, upkeep, maintenance, resistance to damage and wear, and aesthetic requirements.

A simplified statement of the basic need in acoustic design is: sound reverberation within each teaching-learning area is a larger concern in good acoustic design than the separation of sound between areas. The period of reverberation in each space controls the degree of liveness in that space. The reverberation time, or liveness within a given space, controls the clearness of communication by sound within that space. If communication by sound is clear and easy within a space, unwanted sound from outside the space may be greater without interfering with commumication and comfort.

It is obvious, therefore, that acoustical engineering should become a serious part of the design of all teaching-learning spaces. It is also apparent that old cliches about methods of sound

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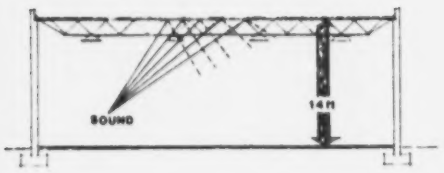

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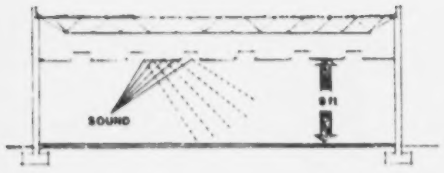

Courtesy Howe Holmes Assoc. Architects

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control and projection and the degree and type acceptable to building occupants should be reexamined in terms of current educational program trends and emerging school building design. Certainly the acoustical engineer must be both an early and a continuing planning professional member of the school building architectural design team.

Zoning of sound. Zoning as related to sound engineering revolves about the basic premise that prevention is better than correction.

Every effort should be made to acquire a site that has a relatively low ambient noise level. If possible, the school should be located at some distance from arterial streets and roads, railroads, airplane flight patterns, and other types of noise. Noisy sites must be used when necessary but greater sound interception in the buildings' exterior walls must be provided. Even somewhat remote locations (especially those near highways, railroads, airfields and industrial plants) can be noisy.

It is advisable to locate noisy activities nearest the outside noise source. In this way, spaces housing noisier activities can shield quiet activities. This type of protection can be augmented by substituting turf, gardens and ground-covering for hard paving. The planting of trees, bushes and shrubs on and around the site will also reduce noise.

In planning a school, it is important to group noisy activities together. Thus, playgrounds, gymnasiums, and shops can be located near each other. Administrative offices, library, and general learning spaces can be in a quiet zone removed from the noisy activity area.

If activities with different noise levels are not adequately separated by space, it will be necessary to physically intercept sound to prevent conflict.

Application of acoustical materials. Conventional acoustical materials for noise reduction and reverberation control usually have been applied to the ceiling. Although this is a widespread practice, instrument tests have demonstrated that it alone is not totally effective. Flat acoustical ceilings have been credited with unrealistic absorption capabilities. Also, little consideration has been given to how far reflected sound must travel and that diffusing obstacles might lie in its path. With the application of carpeting to school building floors, an important acoustical material has become available to the school designer. Carpeting has a significant advantage over most other acoustical materials in that it prevents as well as absorbs unwanted sound. By eliminating many floor level noises such as scraping chairs and shuffling feet and absorbing disturbing sounds originating from other sources, carpeting contributes to good hearing and speaking conditions in the classrooms and hallways.

Sound and open space schools. Designing proper acoustical environments in schools has become a matter of increasing importance — and some controversy — with the advent of more open space planning. Buildings that are flexible and adaptable, and that permit flow between small and large spaces, and quiet and noisy areas, have raised acoustical issues that must be resolved. Providing acoustical separation between activities and groups of people who are not separated by a wall and determining the least amount of acoustical separation that allows persons — either alone or in groups — to work and communicate effectively are the new challenges. Open space planning also has raised some new questions: What constitutes an objectionable noise? What sounds are tolerable and do not interfere?

The degree of quiet that was expected in enclosed classrooms in neither desirable nor possible in open space schools. Low level background noise of a general nature is normally not distracting. Therefore, much of the

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resistance to open space based on the negative effects of sound transmission is a matter of personal taste and habit rather than demonstrable negative effect.

Noise reduction in open space schools can be accomplished by several means. The most obvious is the grouping of noise-producing activities in enclosed spaces away from the general learning and quiet spaces. Carpeting is an essential component of acoustical design of open spaces.

Acoustical separation of spaces can be accomplished with several types of physical barriers. Operable partitions can be moved, folded and unfolded at will to divide spaces. Some operate on fixed tracks; others are more flexible. Improvements have been made in the acoustical quality of these barriers. The selection of this equipment should involve a consideration of performance capability, compliance with operation specification, cost, quality, installation and service. Because these partitions are expensive, they should be installed only where essential.

Demountable partitions can be erected and removed to accommodate changes in space requirements. They are not like operable partitions although some types can be easily moved. Demountable partitions can be installed in a completely finished room without changes to the structure, after the floor covering and ceilings have been installed. Unless careful consideration is given to the space above the ceiling, sound leaks may occur between divided spaces.

Storage cabinets, bookcases and other furniture can be used as visual barriers although they are not capable of providing a high degree of sound isolation.

Free-standing screens provide some acoustical separation and are easily removed.

Sound and enclosed spaces. Enclosed classrooms should receive acoustical treatment that is appropriate for the activities they will house. Specific information regarding acoustical needs of various learning and auxiliary spaces can be found in Units G and H. Since corridors and toilets were not discussed in these earlier Units, some mention should be made regarding them here.

Unless adequate noise reduction treatment is provided in corridors, they can act as communication channels conveying sound through a building. Thus, unwanted sound from a noisy activity can be conducted to an area where quiet is desired. Noise reduction treatment that will minimize locker noise also is advisable. Although the ceilings of passageways ordinarily are acoustically treated, in most cases the application of acoustical materials to one boundary is insufficient. Even covered passageways that are open to the outdoors on one or two sides require acoustical treatment because of the flutter echo generated between sidewalks and ceiling. Proper attention to both floor and ceiling surfaces is essential.

Hard, impervious surfaces are often specified in lavatories and toilets. Because such materials conflict with desirable acoustical treatment, these spaces need special attention to reduce noise and create an adequate soundbarrier between adjacent spaces.

THE THERMAL ENVIRONMENT

There is more to the thermal environment of a school building than the HVAC system operating within it. Air temperature and quality are determined by a number of interrelated factors, including:

- the number, size, insulative qualities and orientation of windows
- the quality and extent of insulation
- the quality of sealing
- the color of the building shell
- the use of interior and exterior shading devices
- the climate
- building orientation
- landscaping - trees, site grading, etc.

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- the number of building occupants and their activities
- the lighting system
- the efficiency of mechanical and electrical systems
- other equipment operating and generating heat

In designing a school building or planning a renovation to provide thermal comfort, it is necessary to consider all of the above factors with respect to their cost (both initial and life), their effect on energy use, and their impact on the perceptions and behaviors of the building users. This delicate task often involves balancing one need of priority against another and selecting the most advantageous alternative. Compromise of this type is particularly necessary in locations where seasonal temperature changes are extreme and designing for warmth in the winter and cooling in the summer is necessary.

Minimizing energy use. An important goal in creating a thermal environment that does not make excessive energy demands is to minimize uncontrolled or unwanted heat transfer through the building shell. This means that efforts should be made through effective insulation, thorough sealing, careful window placement and building orientation to prevent heat loss from a space being heated and the admission of heat into a space being cooled. By reducing heat trasfer of these types, the load on the HVAC system may be kept at a reasonable level and unnecessary energy use decreased.

Planners and purchasers of equipment for heating, ventilating and cooling educational facilities should specify those systems that use energy conservatively and that can be operated efficiently by operations and maintenance personnel. Some educational systems are installing computer monitoring systems to better control energy usage and thus reduce unnecessary costs. As with all items to be designed or purchased for educational facilities, it is imperative that life-costs of the equipment be calculated and analyzed. (See Units J and K for discussions of benefit-cost analyisis and life-cycle costing.)

New demands. Four developments have influenced the design of heating, ventilating and air conditioning systems for educational facilities today:

- the open space plan
- the cost of energy and the need for national energy conservation
- extended community use of educational facilities
- the pressure for economy

Rather recent architectural freedom in the design of educational facilities has affected heating, cooling and ventilation. Large interior spaces with or without operable and demountable walls have allowed flexibility in educational programming. They have, at the same time, dramatically increased problems of heating and cooling — problems compounded by the increased use of electronic media and computer instruction, variety in the shapes and sizes of learning spaces, flexibility, and interchangeability in functions. When rooms and spaces were of fixed dimension, it was a relatively simple matter for the mechanical designer to select a system that could heat, cool, or ventilate a given space. Specifications were based on the size, occupancy and a predetermined function of the space.

Open space and thermal equipment. It is a different matter to design for adequate comfort in a space where none of the above conditions are constant. Large, open spaces do not permit individual control of temperature. Operable walls, demountable partitions and open, unobstructed spaces have greatly reduced wall space where distribution equipment and control mechanisms can be installed. Consequently, ceiling distribution and rooftop placement of heating and cooling equipment have become common practice. As a further refinement, much has been done in the area of combined heating/cooling and lighting systems in an overall ceiling as-

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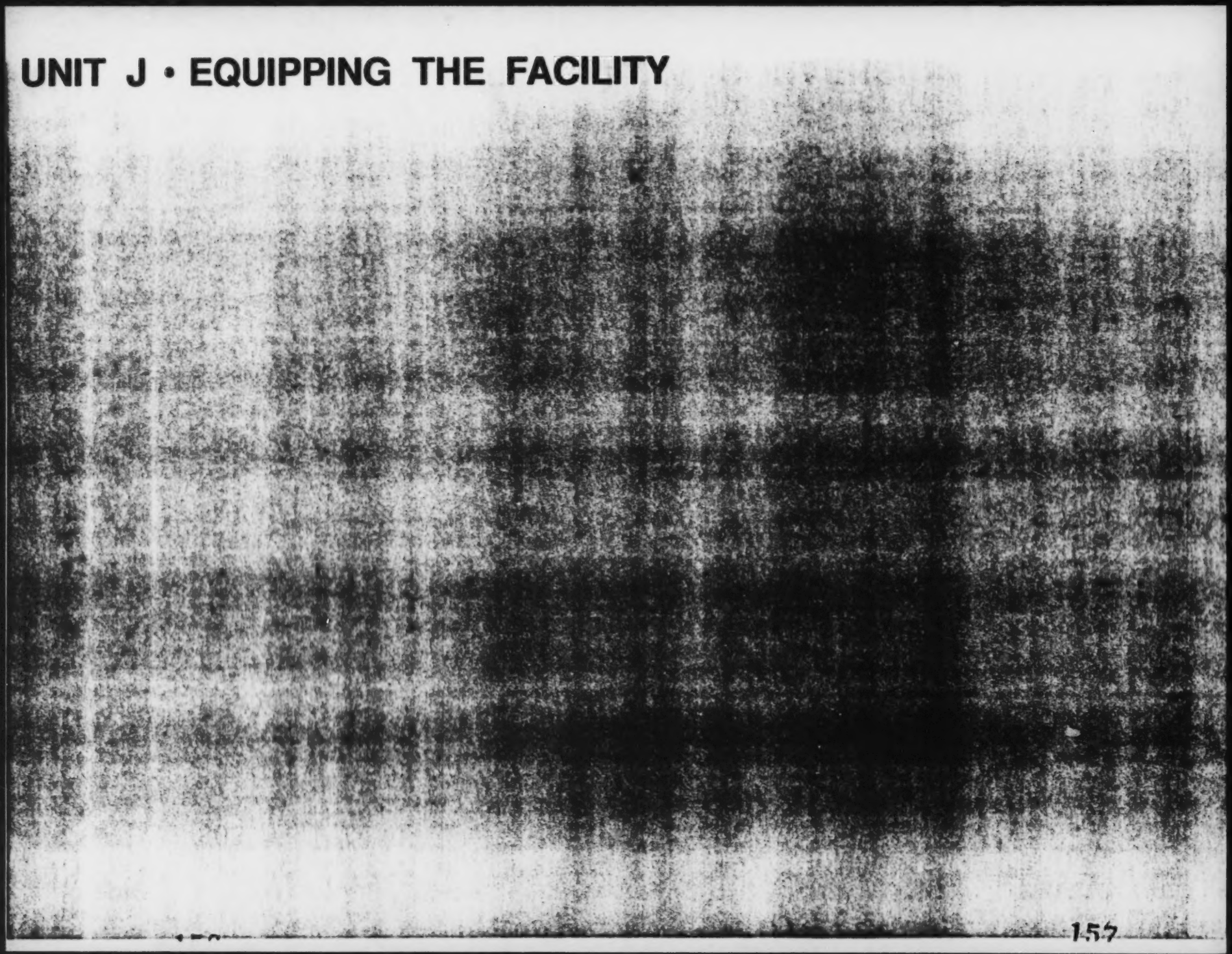
sembly. Some of these systems are based on a module of air/light distribution that covers a given area of floor space regardless of partition location. While a number of these systems are proprietary, many architects and engineers have designed satisfactory component systems that are competitive with packaged systems.

Cooling educational facilities. The increased use of cooling in school buildings has become necessary with open space planning. Air conditioning is also necessary where the climate demands or where schools are used all year. Ongoing developments in the field of heat recovery or reclamation have sought to balance costs and conserve energy by storing waste heat from integrated lighting and cooling systems for reuse as heating sources. When cooling of the school environment operates as an inseparable, productive component in a heating/cooling cycle, it cannot be viewed strictly as an amenity.

Energy-conscious design. Many innovations have already appeared in the field of heating and cooling. More are needed, particularly research and experimentation related to new energy sources (especially solar energy) and their application to the school environment, refinement of efficient mechanical systems, and architectural design that supports such systems. Schools that demonstrate a respect for the natural environment are both desirable and necessary.

Facility planners and designers should seek the technical assistance of engineers who specialize in the thermal environment and should attend to new developments in architecure and engineering that allow conservative energy use.

UNIT J • EQUIPPING THE FACILITY



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EQUIPPING THE FACILITY

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EQUIPPING THE FACILITY

The familiar image of Mark Hopkins sitting on the end of a log busily engaged in recitation is representative of the commonly held conception of the role of furniture in schools. If tables and chairs can hold people, paper or materials related to instruction, they are considered adequate. This limited reasoning gives little or no attention to the proposition that furniture and equipment play an indispensable part in providing a creative environment for learning. The current demands for varying sized spaces to accommodate varying sized groups of students would suggest the need for differing types of furniture for differing instructional needs. The same is true for the equipment necessary to serve the instructional program. The main objective in equipping a facility is the enhancement of the educational program. The quality of furniture and equipment could well be proportionate to the quality of teaching and learning that will be possible.

The selection of appropriate movable, fixed and built-in furnishings and equipment begins with the appointment of a selection committee composed of users, designers, and the architect under the direction of the professional school planner. The responsibilities of this committee will include studying the curriculum to determine the types of furniture and equipment needed, determining the standard of quality to form the base for developing specifications, evaluating competitive bids, and making recommendations for purchase.

A successful selection process will depend on an understanding of selection criteria, on the timing of planning for furniture and equipment, and on the adequacy of the budget. The committee will need to know the basic categories of furnishings, the manufacture process, and the procedures for writing specifications and analyzing bids.

CRITERIA

Basic criteria to guide the selection process include:

Appearance. Items of furniture should harmonize with the architectural surroundings. They should be attractive in terms of color, form, texture, and should contribute to the beauty of the environment.

Flexibility. Furniture and equipment should not only accommodate current needs but also support evolving programmatic needs. Movability, adjustability, and multi-functionalism are important characteristics. It is critical that the users — teachers, students, administrators — be able to modify the environment. When equipment can be disassembled, rearranged, expanded, reduced, or otherwise changed to suit changing activities and needs, an important requirement has been satisfied.

Safety. Furniture and equipment should be fire retardant and should not produce toxic gases or smoke should they burn. Items should be composed of non-allergenic substances. They should not have dangerous protrusions, nor should they easily pinch, tip or collapse. Corners, edges, and hardware should be designed to prevent injury. All edges should be rounded and, where possible, composed of or covered with resilient material. Where the young user could lick or chew objects, materials and finishes should be non-toxic.

Durability. To insure durability, items should be tested under conditions similar to those in which they will be used. Manufactures should be asked to provide samples. Remember that furnishings may be used for purposes other than they were purchased or intended.

Maintenance. Low maintenance is extremely important. Replacement parts should be easily obtainable.

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Comfort. Comfort of the users should be considered. Scale, texture, form, light reflected and adjustability are important considerations.

Building codes. Do all items adhere to applicable building codes? Many states have codes requiring minimum standards of design.

Guarantees. Terms of furniture and equipment guarantees will vary and should be checked with the manufacturer. Some items may be guaranteed for the life of the building; other items may carry no guarantee at all. Most items carry at least a one-year guarantee against defects in workmanship and material.

Cost. Purchases should never be based solely on lowest price. If an inexpensive item is not durable, does not fulfill educational requirements, lacks safety features, or does not meet other standards, it will be costly later. The long-term expense of operating and maintaining furniture and equipment is more critical than their initial cost. The original cost plus the cost of ownership should be considered. The most efficient product and the one that can be maintained at less cost is ultimately less costly.

Services of the manufacturer and/or distributor. Customer service provided by the manufacturer and/or distributor is an important consideration. Willingness to repair or replace faulty items, ability to meet delivery dates, quality of installation and clean-up, and willingness to modify standard products when required on large orders should be examined. The supplier should be close enough to the school to provide service in a reasonable amount of time. If there is no prior experience with the supplier, references from other customers should be obtained.

TIMING

Timing the acquisition of furniture and equipment is important so that sufficient funds can be budgeted and satisfactory delivery schedules can be arranged. When bond issues are called for voter approval, the precise cost of new or renovated facilities are not known. In too many cases, building plans are completed and construction budgets are considered. This is too late. It has been established that there is a direct correlation between effective instructional systems and the kind and quality of furniture and equipment. Budgets for these items must be established concurrent with the construction budget to insure proper equity.

This phase of the planning process cannot be overstressed. Obsolete or insufficient furnishings and equipment in a new, well planned and designed school can destroy a positive impact on users and the instructional program. Proper and timely planning can insure a successful conclusion.

Delivery schedules of manufacturers are another consideration calling for timely planning. Deliveries may vary from two or more weeks for desks and chairs to two or more years for some specialized equipment. Orders should be timed so that deliveries coincide with the construction and occupancy schedule.

BUDGETS

The budget for furnishing will vary with the function of the facility. Elementary and secondary schools will normally require from 15% to 25% of the projected construction budget. Specialized buildings such as university libraries may require up to 50%. Budgets for major research facilities may well exceed the cost of building construction. The development of the furnishings budget early in the planning is imperative.

EQUIPPING CLASSROOMS

Classroom furniture and equipment falls into these four basic categories: tables; desks; chairs; and cabinets and dividers.

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BELLAMY ELEMENTARY SCHOOL
TAMPA, FLORIDA
ROWE-HOLMES ASSOCIATES, ARCHITECTS

Tables. Tables are produced in four basic shapes: the rectangle, the square, the circle and the trapezoid. Rectangular and square tables are traditional and are normally used in areas where they can be lined in rows, for example, a library or study area. Each table can accommodate four or more students depending on size. These types of tables do not lend themselves to grouping in shapes other than their own. The round table, which must be used individually, requires less floor area and succeeds in providing a seating arrangement that encourages cooperation. Adaptations are available in half-round forms. The trapezoidal shapes permits a variety of grouping possibilities, which offers more flexibility for modern instructional programs.

Tables were once considered necessary only for areas where large groups of students would be accommodated, i.e., in libraries and in study areas. Creative teachers are now discovering that multiple student tables can make a significant contribution to the instructional program. The use of tables can encourage discussion, participation and cooperation, while giving students more working space.

Desks. Student desks have evolved from those arranged in rows and bolted to the floor to those arranged in rows but not bolted to the floor. The flexibility of these individual stations is negligible; they offer little more than their anchored predecessors. These desks are found in two basic models, the chair-desk and the desk with chair.

The chair-desk is a combination of a seat and a writing surface. The classic and thoroughly familiar style is the arm chair with the small writing space on the right or left side. Books and materials are stored under the seat or in a wire rack at the side or back of the chair. This particular chair is not appropriate for a modern classroom. Adaptations featuring full writing surfaces (18" x 20" or larger) are more appropriate for extended periods of study.

The desk with chair is a modification of the chair-desk. It is characterized by a full rectangular, square or trapezoidal writing surface with storage space on either the right or left sides, under the top, or in a well reached by lifting the top. The student chair is not attached. The desk with chair offers more freedom in grouping than the chair-desk. A large writing surface should be a primary specification.

Chairs. Student chairs are available in two basic styles, a molded one-piece shell and a seat with a separate backrest. Backrests are either fixed or adjustable, but the latter feature adds to the cost of the chair. It is an important consideration in comfort, however, and should receive attention. The type of chair selected should encourage proper posture of students who must sit for extended periods of time.

Cabinets and dividers. The use of movable cabinets and panel dividers is a direct result of the trend toward open space for instruction. These units often replace traditional room arrangements as "containers" of education. Their importance in meeting the demands of this role, coupled with the lack of available research, necessitates careful evaluation.

Using the typical 3' x 5' x 5' storage cabinet on casters as a movable divider may not be practical. The standard cabinet usually weighs approximately 75 to 100 pounds when empty, and up to 300 pounds when filled with paper and books. Moving this much weight is usually beyond the capabilities of most teachers and students, thus these dividers often become permanently placed. Careful attention should be given to the selection of units when ease of movement is desired.

Lightweight panels on casters featuring bulletin board and chalk board surfaces are serving more and more classrooms as space dividers. Their ease and rapidity of movement make them a highly desirable consideration.

Equipment for classrooms ranges from pencil sharpeners to microcomputers. The sophistication of these kinds of items varies widely but all require examination in relation to the quality of program desired and the wise expenditure of funds. Manufacturers' specifications and specialists in technology should be consulted.

EQUIPPING LABORATORIES, SHOPS, AND SPECIALIZED TEACHING AREAS

These areas include science, language, mathematics and social science laboratories, vocational shops, home economic facilities, and music and art studios. The furniture for these areas is specially designed to accommodate curricular innovations while meeting safety standards. Equipment often comes as a part of specific furniture items or is designed to coordinate in meeting curriculum requirements.

Many of these items are produced by specialty companies. The school planning specialist can help in determining specifications.

EQUIPPING OFFICES

Contemporary office design ranges from the traditional desk, chair, credenza and side chair to modular self-contained units with privacy panels. A wide choice of wood and steel models are available in all price ranges.

The selection of office equipment will depend on its function. Specialists should be consulted on the availability of built-in or portable items and on the desired quality.

EQUIPPING RESIDENT CENTERS

Today's dormitories bear little resemblance to the one- or two-student room arrangements of the past years. Student residence halls are now designed to accommodate a wide variety of living, learning, and recreational styles. Furniture and equipment needs range from beds and dresser to sofas and computer terminals. Again, specialists in these areas should be consulted to obtain the latest information on product availability. The committee should be particularly careful to insure that current trends in student housing are understood and accommodated.

EQUIPPING RESEARCH CENTERS

These facilities present problems related to their unique structural and utility requirements. The architect and engineer must work closely with users and manufacturers to insure the necessary detail work. The professional school planner can serve as a coordinator in these special cases.

EQUIPPING LIBRARIES/MEDIA CENTERS

If libraries are the storehouse of the world's ideas, and if the role of education is to bring students and ideas together, then the library-resource center might well be the most important space for teaching and learning. Furniture and equipment for this area should be selected with this in mind.

Besides seating, shelving and file space, the library will require a variety of electronic, computer and audio-visual equipment. A specialist in library design and function can recommend the latest in technology with the flexibility to accommodate certain change and refinements.

EQUIPPING FOOD SERVICE AREAS

The complexity of food service furnishings range from one or two vending machines to full-service cafeterias to accommodate thousands of students. Considerations must include commercial food preparation and serving equipment, beverage dispensers, and table and chairs. New developments in food technology and their implications for the future should be studied. The preparation of nutritious, appealing food dishes at the most efficient unit costs is the goal.

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KASEDA ELEMENTARY SCHOOL
KASEDA-SHI
ISHIMOTO ARCHITECTURAL FIRM

OGAWA ELEMENTARY SCHOOL
HIGASHIURAMI
TANAKA-NISHINO ARCHITECTS AND ENGINEERS

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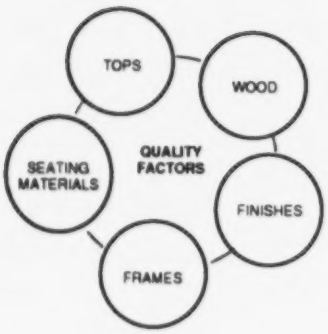

The expertise of specialists in this area will be essential in the planning and selection process.

EQUIPPING MAINTENANCE AND PLANT SUPPORT FACILITIES

Large self-contained educational systems such as universities and large school districts must provide a variety of services, each requiring specialized furniture and equipment. These support facilities include electrical and plumbing shops, auto and bus repair and maintenance facilities, refuse collection systems and security stations. Planning for equipping these areas is important if maximum services are to be achieved.

EQUIPPING AUDITORIUMS AND PERFORMANCE STUDIOS

These specialized areas have unique requirements, including lighting, acoustics, seating, and sophisticated stage rigging for props and curtains. Because these areas are highly visible, they must be technically correct and aesthetically pleasing. The coordination of specialists, manufactures, architects, and engineers and contractors is essential.

QUALITY FACTORS

Material used in the manufacture of furniture include steel, wood, laminates, fiberglass and plastics. The manufacturing process is similar regardless of the manufacturer; the differences appear in the quality of the basic materials, the care exercised by workers at strategic points of manufacture, and the finishing process. These differences are reflected in the price of the item. Accepting a product lower in cost and quality could result in a higher net cost due to continuous maintenance and limited longevity.

Frames. The steel used in frames for chairs and in legs for tables is either round or square. The frames begin as straight pieces of pipe that are swagged by machines to the desired sixes and taper. They then pass to bending machines for shaping. Welding is done by machine or by assembly line workers. Hand welding is usually associated with higher quality furniture.

The completed frames, swinging from overhead conveyors, move from the welding area to the paint chamber. The frames are rotated and magnetized on entering the chamber. As they pass through, a fine mist of paint is sprayed into the chamber, completely covering each frame. The unequal distribution of electrons and protons resulting from the magnetic force insures the attraction of the paint to the metal. The painted frames then move through a drying cycle.

Finishes. Two types of paint are used: enamel and epoxy. Enamel is the least expensive of the two. An investigation of chairs with this type of paint reveals that chipping and scratching will occur with use. The epoxy resists chipping and scratching and will retain its appearance longer. This difference is one of the variables to be considered in the selection of the desired quality.

Wood. The wood used in table or desk tops is of two basic types. One is a solid-core pressed board ranging in thickness from one-half to one-and-three-fourths to two inches. The other is a hollow core, which consists of a frame in the desired shape and size. A sheet of plywood is placed on one side and a cardboard honeycomb is placed on the frame. Another sheet of plyboard is then placed over this to form the top. The hollow core has the obvious advantage of less weight, but at the same time it is not as durable. The weight factor should be considered where ease of movement is important, such as in early learning and primary classrooms.

Tops. The laminate found on table and desk tops and used to cover cabinets and other items is a plastic material glued, under extreme heat and pressure, to the surface of the wood.

Laminates come in a variety of colors and patterns and are highly desirable for their ease of cleaning and resistance to liquids.

Seating materials. The materials used in the manufacture of seats for chairs are plastic, fiberglass and wood.

Liquid plastic is injected into molds and subjected to heat and pressure to form shells, seats and backs. This process is less expensive than others and results in a basic chair at a lower unit cost. Its major advantage is the flexibility of the materials that permits a slight movement as the occupant shifts positions. This provides a degree of comfort. The porous or rough surface of the material is necessary to hide the lines formed by underneath support ribs. This type of surface collects dirt easily and is difficult to clean.

A new molded plastic featuring a smooth surface has been introduced. This product retains the advantages of the traditional plastic seat while reducing the disadvantages. The future development and improvement of this material will have a decided impact on the industry.

Fiberglass is formed under extreme heat and pressure and is a durable and attractive product. Fiberglass seats feature a smooth, nonporous surface that is easily cleaned and that retains a satisfactory appearance. While it is not impervious to vandalism, it is a durable material under normal use.

The most desirable wooden seats for chairs are thin plys bound by glue, heat and pressure and molded to the desired shape. They are usually varnished or covered with a plastic laminate.

THE BID OR TENDER ANALYSIS AND PURCHASE

The system used for acquiring the desired furniture and equipment involves the following:

(1) Preparing written specifications for bidding
(2) Announcing and receiving bids
(3) Analyzing bids or tenders
(4) Making recommendations to the governing board for purchase.

Each step is important to the outcome and demands careful consideration.

The selection of furniture and equipment to serve as models for preparing specifications is the first task to face the committee. Samples must be examined and the various points of comparison must be considered. This process requires objective analysis and the ability to discern the relationship of price, quality and function. Some questions to be asked include:

1. Does the item meet the unique need of a planned instructional program?
2. Is the quality of manufacture adequate to insure the wise expenditure of funds?
3. Will the item be sufficiently maintenance-free?
4. Is the price within the budget allocation?

When the selections have been made, detailed written specifications are prepared on each item of furniture and equipment. The specifications should include the necessary data to enable suppliers to bid or tender on specific items or on proposed equals. In some cases, bidders may be asked to submit samples of proposed equals for approval prior to acceptance of bids. The bid form also should contain detailed instructions about delivery and installation.

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After tenders have been received and officially opened, the committee must concern itself with the bid analysis. This procedure requires the evaluation of prices to determine the low figure on each specified item, and whether or not items proposed as substitutes qualify as approved equals. The tender analysis is to be prepared in writing. It is a critical phase if full value is to be received and the needs of the instructional program are to be met. Attention to detail is important at this stage of the process. The bid analysis concludes with the committee's recommendation for purchase.

UNIT K • PROJECT BUDGET AND COST CONTROL

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PROJECT BUDGET AND COST CONTROL

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PROJECT BUDGET AND COST CONTROL

Educational facility planners attempt to develop buildings that represent in value and cost what taxpayers conceptualize as a "good buy." This means a facility that looks good, functions well, is initially affordable, and will have reasonable operational and maintenance costs. In short, the goal is to get the most for the money spent.

Because of the complexity of the planning process and the large numbers and varying roles of the persons involved, there are numerous opportunities for either wasting or saving money. The decision to build sets off a chain of other decisions that have implications for the cost and the effectiveness of the resulting structure, both initially and for the life of the building. Cost is affected during each planning stage — building programming, planning and design, bidding, preparation of contract documents, construction, equipping, operation, maintenance, evaluation, and rehabilitation. Although this sequence of events may span half a century or more, the basic economic success of the project stems from the effectiveness of initial planning and cost consciousness at each stage.

No single decision will result in an economical school building. An efficient HVAC system alone is not the answer; nor are multiple stories, use of natural light, centralized site, and so on. No single planning innovation, structural system, building material, or contractual arrangement will ensure an economical building. Numerous opportunities for economy exist. Consistent attention to these opportunities and well-informed appraisals that consider long-term as well as initial costs will result in true economy.

Because cost control is an intrinsic part of the planning process, it has been a recurrent theme throughout this book. It is therefore strongly recommended that readers re-examine preceding units for information related to cost. The purpose of this unit is to summarize primary cost considerations that have been previously mentioned, to introduce additional information related to economy, and to discuss briefly cost/benefit analysis and life-cycle costing.

OPPORTUNITIES FOR SAVINGS

A commitment by boards of education and professional educators to the planning process for a project is essential. Schools represent large investments for every community and need to be planned with intensity. Because opportunities for saving money arise throughout all stages of planning, design, and construction, this section will examine the major opportunities as they chronologically occur.

Use of professional services. An often repeated axiom of school building projects is that good school design results when a thoroughly professional architect gets together with a thoroughly competent owner. The architect should be carefully chosen and should bring to the project both capacity and a willingness to investigate and fulfill the user's needs. The owner and the architect must develop a working relationship characterized by mutual respect and cooperation. The levels of skill, imagination, and intelligence with which each party performs its functions will affect the cost of the project.

Other individuals whose expertise can help to save money are various specialists who are consultants in educational programming, space planning, and site development; in structural, mechanical and electrical engineering; and in acoustics, lighting, furniture and equipment planning. The nature and number of consultants and their fees and responsibilities should be determined at the outset of the project as a means of achieving the most cost-effective facility.

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The employment of specialists — in particular, a professional educational facility planner — helps to ensure that the project will benefit from current knowledge and technology, that it will develop smoothly and on time, and that misunderstandings that often result in redesign, rebidding, and delay (all of which are costly) can be avoided. Obviously, a high degree of cooperation is essential for an integrated approach to planning.

Development of educational specifications. Once educational goals for the schools are clearly stated, educational specifications can be written. Educational specifications seek to relate spatial, equipment and special environmental needs, all of which can be assigned a dollar value, to program content and activities. It is essential that the building's users be involved in the preparation of this document and that they be allowed to express their anticipated needs and preferences. Participatory planning will help to prevent the specification of unusable space and unwanted items and the omission of equipment and furnishings. Only by allowing time and resources for thorough and accurate specification preparation can potential economies be realized. Recommendations should be based on suitability and compatibility with the educational program. Cost/benefit analysis is an important decision making tool that may be employed here.

The development of educational specifications serves another important function related to cost in that it presents an opportunity to develop a consensus about particular facility needs before architectural planning begins and before construction is undertaken. Every change made afterward may involve additional expense. It is important, therefore, that educational leaders recognize their responsibility for this step.

Sophisticated computer-based tools for determining program requirements have been developed. Simulation techniques allowing the testing of the building program in terms of utilization and efficiency criteria can be implemented. Preperformance testing of this nature may provide economies of important dimension.

Design. The design of a building offers ways to control costs while providing a structure that is both aesthetically pleasing and functional. A compact building can reduce costly exterior walls. The design of a building commensurate with the educational specifications can result in the minimum of square feet being constructed. The building materials, selected from several alternatives, greatly affect total building costs. This list is not exhaustive. An important part of cost control is at the design stage where there are many actions that can control costs. Total and open communication between the owner and design team is essential.

Stock plans. Attempts to reduce facility costs by eliminating professional services through the use of stock plans seldom produce satisfactory results. Because of their inability to respond to unique program needs, stock plans should be avoided. Indeed, dollars saved by eliminating professional services are small compensation when the result is a school building that cannot accommodate the desired program.

Stock plans present the additional problem of often not being adaptable to preferred or available sites. Local preference and pride in design and aesthetic appeal are also factors that have made stock plans unacceptable.

Repeat plans. Repeat plans differ from stock plans in that the repeated plans are those that the owners have judged as desirable after evaluation of an existing building. The use of such plans usually saves some professional fees and results in additional savings since the time spent to develop construction and bid documents is reduced significantly. Cost can be controlled, too, through reusing the

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furniture and equipment specifications and bid documents.

Site selection and development. The site and its features can significantly affect the cost of construction. Subsoil conditions can affect foundations and drainage, severe topography may require costly site preparation, size may be a determinant in the shape of the building, and the existence of natural vegetation will affect landscape and planting costs. The character of the immediate surroundings also can affect the building costs. For instance, an inexpensive site located beneath a jet air-craft approach may actually be costly in terms of exceptional acoustical barriers required to combat noise. Hidden costs related to all site features must be investigated.

In the urban school setting, imaginative solutions to the use and development of the school site can introduce economies as well as extend the impact of the school and its program. Sharing the school site with other community functions makes good sense, as do joint occupancy situations where the site and/or building are shared by education, commerce, industry, or housing. Not only can such combinations prove economical in terms of land use and construction, but they can also be rendered educationally viable. Finally, the use of air rights above highways, railroad tracks and yards, and other urban elements may provide alternative site locations that otherwise might be prohibitive in cost.

In areas where land appreciation values are high, it may be preferable to acquire school sites in advance of actual need. Early purchase may involve a lower cost. However, land acquisition, whenever undertaken, must be based on solidly researched, accurate projections and careful long-range planning. Site selection and acquisition should be integrated with other community developments. Coordination can introduce real economies by ensuring that proper utilities, access roads, and services exist; that the school is centrally located; and that sufficient land is available to meet community educational needs. Selecting sites that are very near the population to be served by the school is now of greater importance than ever before. Reduced vehicular transportation will result in savings that are potentially great.

Scheduling. A great deal of time is required for those involved in a building program to reach decisions and complete activities related to programming, planning, preparing drawings and contract documents, securing necessary local and state regulatory agency approval, and bidding of projects. It is necessary to develop a complete and firm timetable for these activities to which all parties must adhere. Each day of delay represents an increase in cost.

A logic network can be used as a scheduling tool. The Critical Path Method (CPM) and the Performance Evaluation and Review Technique (PERT) are two well-known networks that are useful when planning and constructing educational facilities. Both require the identification of tasks and the estimated time to complete each task, and the sequencing of events. Computer application is common.

Building codes. Building codes can sometimes prohibit or restrict the use of new materials and construction techniques that would contribute to efficiency and cost savings. Building codes, zoning ordinances, and other regulations properly exist to maintain health and safety standards and to ensure public welfare. However, their relevance and validity must be constantly reviewed to avoid the imposition of unnecessary costs on school building construction. School planners and administrators should assume a major responsibility where building codes unnecessarily subvert school building economies. Through early and effective communication with officials in regulatory agencies, it is often possible to have certain codes and restrictions interpreted and/or

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waived. Such efforts should produce time and cost savings and, most important, environments that comply with safety standards.

Cost estimates. At various stages in the planning process, cost estimates must be developed by the architect to ensure that the projected costs and the project budget are in agreement. There is far less chance of a budget crises when the bids come in if checks have been made at several points during planning. These cost estimates should be increasingly thorough and accurate as the design develops. The small additional expense of retaining professional cost estimating services is usually justifiable for owners as well as architects. Also, a contingency cost factor is necessary, but it should not be so high as to encourage frequent change orders during construction. A usual range is three to four percent of construction costs.

Bidding. Clarity of bid documents and time of advertisement will affect costs. Complete and precise contract documents will aid the contractor in making accurate cost estimates. Incomplete and confusing drawings and specifications will sometimes cause the contractor to protect himself from unforeseen costs by adding a substantial contingency figure to his bid. A prebid conference between the architect and competing contractors is a good idea, especially if unusual design or construction practices are to be employed.

Even with complete and clear drawings and specifications, adequate time must be allowed for the contractor to complete his estimate. A rush job opens opportunities for omissions and errors and will not allow sufficient time for obtaining subbids. Adequate time will vary from place to place and may depend upon the amount of other construction out for bid in the area at the time of bidding for the school project.

Bidding should be related to local conditions as well as to the time of the year. Although of less importance now than in the past, construction is still a cyclic business with activity peaking during the spring and summer and slackening in the fall and winter. The time of bids should take advantage of seasonal changes. Also, local conditions may indicate a favorable or unfavorable time for taking bids — if a larger volume of construction is under way, it may be difficult to interest contractors in developing close bids.

In some areas of the country, the form and number of contracts required for public construction are dictated by law, but, where possible, both the single contract and the multiple contracts systems should be considered. Each should be frequently re-examined for its effect on school costs, particularly with regard to allowing options in the bidding procedure to take full advantage of the prevailing construction climate.

Add and deduct alternates in the bid can result in the owner getting the maximum building for the dollars available. The presence of alternates in a bid document assumes, of course, that cost estimates indicate that all desirable elements of a project may not be affordable. The general conclusion is that an owner most often does not receive full value for the dollar in an add-deduct alternate situation. Well planned, however, they do give some bidding flexibility and make it unnecessary to rebid a complete project. The alternates rather than the whole project can be accepted or rejected.

A recent addition to the bidding process for public projects, including educational facilities, is prebidding or phasing certain elements of the project. Most often, elements that come early in construction are the ones that are prebid or phased. It is common, for example, to bid early for site work, foundations, and steel. This could result in lower prices because of an early bid date. However, as a guard against not having sufficient funds to complete the project, the owner and

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architect have to make certain that the bids do not exceed the estimates for those portions of the project being prebid.

Construction. It would appear that with competitive bidding and a fixed price contract, the last opportunities for developing economics in the school building process would have been realized by the time construction begins. This is not the case. Construction changes resulting in additional time and expenditures should be avoided and generally can be if programming and planning have been conscientiously carried through. Delays in decisions during the construction can mean money — money for overtime, additional materials, demurrage, and storage — in addition to the frustration of not having the school completed for occupancy as scheduled.

Again, the means for preventing costly changes and delays lies with the contractor, architect, and owner, and the lines of decision making and responsibility among them. For each of these parties, a single point of communication should be designated so that questions can be resolved in a prescribed, straight forward manner without conflicting decisions and opinions.

It is difficult to avoid or deduct change orders at some point in the construction process. But the old adage, that a deduct change order is worth only half of what you think it should be and an add change order costs twice what you think it should, is as applicable today as ever. So it is advantageous for all concerned to plan and communicate with the intention of avoiding change orders.

Supervision and inspection are important in terms of coordinating the work of the project and ensuring that permits are issued on time, that shop drawings are checked on time, that decisions on finishes, colors, and materials are made on time, and that special equipment and casework are on the job at the right time. Good supervision also ensures that if changes do have to be made, they are identified and initiated with the least possible delay and cost. The local school board is advised to retain its own inspector. The cost is minimal in relation to the total project, and the dollar savings usually more than offset the inspector's salary.

Construction and management systems. Owners and architects should be familiar with the cost benefits of project delivery systems such as construction management. CPM and PERT, discussed earlier, are often applied. Design-build, a construction management technique, enables the owner to work with the architect and actually start construction prior to the completion of final design details. Fast-tracking, a similar technique, telescopes the project's time requirements by overlapping various steps in the process of design and construction.

System construction, which subdivides the building into mass produced components that can be interfaced, is another alternative capable of cutting costs by reducing construction time and the need for specialized craftsmen on the building site.

Energy-conscious design. An energy-efficient educational facility is the goal of the owner and the architect, and of their engineering consultants. The energy-conscious design of an educational facility includes (a) site selection and the building's orientation on the site; (b) a detailed review of the educational program, the size and volume of spaces required, and the estimated schedule of building usage; (c) design conditions and criteria that pertain to codes, weather conditions, and building or design requirements; (d) a building design that uses natural conditions; (i.e., light, heat, cooling); (e) the inclusion of passive and/or active systems that rely on alternative energy sources; and (f) supplemental systems (conventional electrical and mechanical) for reduced loads.

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Equipping. A significant portion of the total cost of a school plant goes into furniture and equipment. As indicated in the preceding Unit (J), their selection and purchase offer opportunities for significant economies. The use of elements based on a common dimensioning system can help ensure that components will go together without on-the-job fitting, that elements can be replaced, and that furniture and equipment can be purchased in large quantities. The opportunity also exists for cooperative buying. Through purchasing consortia, several districts or an entire state can buy in quantity at lower prices, once common performance requirements are established.

Mechanical, electrical and plumbing systems. Mechanical, electrical and plumbing components offer opportunities for economy if they are simple to control, easy to maintain, and are selected based on real need. Too often mechanical systems are overdesigned and equipped with costly, elaborate controls that require special personnel and frequent maintenance. As mechanical, electrical and plumbing systems require a larger and larger portion of the school building dollar, it is of great importance that these systems be consistent with needs. It is also important that they do not waste costly and scarce energy.

When possible, the mechanical, electrical and plumbing systems in new buildings should be standardized to systems in old buildings.

EVALUATING COSTS

Two widely used methods for evaluating costs are life-cycle costing and cost/benefit analysis. Both techniques provide information that can improve decision making by supplying objective, reliable criteria with which site, building design, mechanical system, or pieces of furniture can be appraised in relation to others. Life-cycle costing and cost/benefit analysis are important because they allow an informed selection among alternatives based on total rather than initial costs and an examination of cost in terms of value received.

Life-cycle costing. It makes little sense to purchase one product based on a lower first cost if all the costs involved in ownership of that product are higher than all the cost of ownership of an alternative product. Initial costs are therefore relatively insignificant. Attention should be given to total costs, which include the initial costs of a structure (or any of its components) as well as interest and the costs of operation and maintenance. The objective is to determine the best method of satisfying a particular requirement at the least total cost. The cost of operating an educational facility includes the expenses incurred in servicing the building, such as heating, lighting, insurance, and labor. Maintenance costs are those resulting from repairs and renewal. To accurately figure the life-cycle cost of a facility, it is necessary not only to add up all expenses anticipated during the life of the building, but also to calculate the net present worth or the equivalent annual value of those expenses. Only by bringing all expenses to a common time and value can legitimate comparisons be made. Life-cycle costing is uncomplicated in principle. In practice it can be complex because of the numerous factors that must be considered and because the cost of some of these factors can only be estimated. Therefore, it is recommended that the technique be employed by individuals who thoroughly understand the full implications of cost and building design and who are able to make consistent, valid comparisons. Either previous successful experience with life-cycle costing or a careful examination of literature that completely describes the technique is required. The merits of life-cycle costing are not only that it improves economy by developing an awareness of total costs and a comparison of alternative systems, but that it also encourages an examination and understanding of the interrelationships between various aspects of building design and their costs.

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Cost/benefit analysis. Cost/benefit analysis enables planners to view various building designs or commodities in terms of benefits provided related to their costs. Its purpose is to identify the alternative that possesses the best set of design features for the expenses involved. Regardless of whether performance specifications or budgetary considerations are of foremost importance, cost/benefit analysis can be helpful.

Cost/benefit analysis requires that benefits be expressed in monetary terms. However, it is often difficult to reduce benefits to a dollar figure, particularly when they are intangible. For example, how can beauty or comfort be measured in dollars? Although these qualities are quite real and important, they are valued differently by different persons. One way of evading this dilemma is to cancel out such benefits when they are common to all the alternatives considered.

Because both costs and benefits are experienced over a period of years, it is essential that they be viewed in terms of life-cycle costs, not just acquisition costs.

SPECIFIC PLANNING CONSIDERATIONS

The owner, planner, and architect have several means at their disposal to control costs. Described below is a sample of those means. In the total activity of planning, designing and constructing a building, many others are available.

1. Plan early for a total building design that is energy conscious. While initially more expensive, the life-cycle cost of alternative systems can be of significant advantage.

2. At the outset, recognize that the building must be barrier-free. Provisions made at initial construction will be less costly than later renovations.

3. Multi-story planning (within limits) can produce savings unless land is relatively inexpensive and building codes give significant cost advantage to one-story construction.

4. Both the campus and the compact plans for arranging facilities should be analyzed for potential savings in construction. Where land costs are reasonable, codes tend to favor building dispersal. Also, educational programs may be strengthened by decentralized facilities. Otherwise, compact plans may tend to be more economical.

5. Construction savings can be realized by keeping exterior perimeter walls (which are an expensive building element) to a minimum. It only follows that if the least exterior wall area is used to enclose the largest possible floor area, construction dollars can be saved. If, however, low perimeter-to-floor area ratios require air conditioning or climatic controls that otherwise would not be included, potential savings might be lost.

6. Modular planning — the use of repetitive units of space based on a common set of dimensions — can provide for potential savings. Such planning permits repetitive use of structural elements, building components and materials, and furniture and casework. It also can reduce opportunities for error in estimating by the contractor. By making initial job layout, inspection of construction, and checking of shop drawings simpler and less liable to error, modular planning can introduce economies during construction. Modular units should be used cautiously so that the environment does not suffer aesthetically.

7. The planning goals should be to provide an efficient arrangement of spaces that keeps the ratio of gross to net square footage as low as possible. Unnecessary corri-

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dors, circulation space, lobby areas, duct space, and other non-productive areas might be reduced without impairing the educational efficiency of the structure.

8. Economies can be realized by avoiding walls that have low insulative values or that impose special problems in providing and controlling natural light, heating, ventilation and air conditioning. Similarly, careful selection of exterior wall materials can dramatically reduce costs. Partitioning systems for subdividing interior space should be explored. Of course, unnecessary partitions should be avoided.

9. Specifying building and material components that are repetitive in dimension can reduce on-the-job cutting and fitting and provide a significant avenue for construction economies.

10. Selection of materials, finishes, and equipment with proven characteristics of low long-term maintenance costs will provide an economical building if the usable life of the building is considered.

11. Bidding advantages can be gained by selecting — if there is not any major price differential — a structural system that will permit quick closing in of the job so that work can continue out of the weather.

12. Insulation must be carefully designed and specified to avoid under-insulating and to avoid an imbalance of insulation between exterior walls, basement, and roof.

13. As a further consideration in long-term economy, materials should be checked in terms of effect on insurance rates. For instance, while building codes may permit the use of laminated wood beams, insurance considerations may render them more economical in one area than in another.

UNIT L • FINANCING THE CAPITAL PROGRAM

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FINANCING THE CAPITAL PROGRAM

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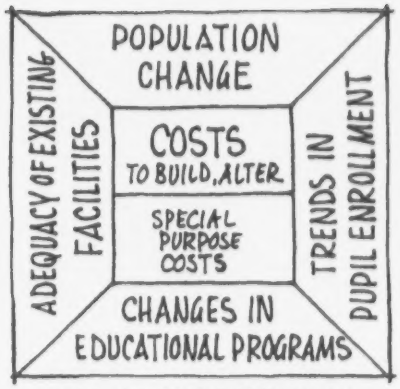
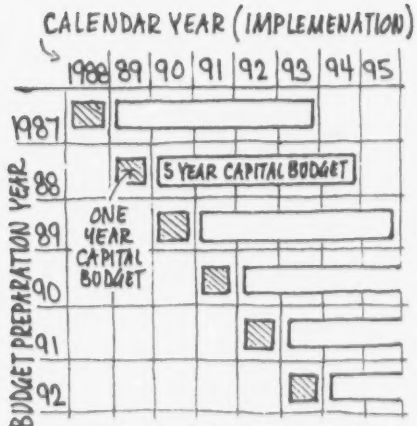


CAPITAL IMPROVEMENT PROGRAM BUDGET



THE CAPITAL BUDGET: LONG RANGE VIEW

FINANCING THE CAPITAL BUDGET

The capital budget is a statement in which immediate and long-range capital requirements for educational facilities are delineated in an orderly manner. Preparation of a capital improvement program budget requires critical assessment of: (1) population change within and among various school district; (2) trends in pupil enrollment within school buildings attendance boundaries; (3) changes in educational programs, including corresponding changes in school organization and instructional techniques; (4) adequacy of existing educational facilities to house the defined educational program; (5) costs required to renovate, alter, construct, or close educational facilities; and (6) special purposes such as renovation for energy efficiency, providing for handicapped persons, and treatment of asbestos. Continual study is the keystone of successful budgeting for both annual and long-range capital improvement programs.

ORGANIZING THE CAPITAL BUDGET

Organizing of the budget document varies among local education agencies. In some localities the format is prescribed by law. In other jurisdictions the budget format is left to the discretion of the local school officials. Documents vary greatly with the size of the school district and with the ingenuity of those responsible for developing the document.

The capital budget proposal should contain two major parts — the immediate or annual capital requests and the long-range estimate of capital improvements. The listing of long-range needs commonly covers a period of five years. Hence, the budget document is a six-years (or annual and five-year) capital improvement program. The fiscal year is a popular method of arranging the budget document. Such a timetable closely parallels the school year and is familiar to federal, state and local fiscal authorities.

The first year receives the most emphasis because the projects cited for that year will be recommended for immediate funding, while the other data indicate the stalemated capital improvements identified for further funding during the forthcoming five years. Each year, at budget-making time, these estimated programs are restudied and refined with the first year being recommended for funding. An opportunity is given to revise upward the priority of a project if the need for it becomes greater. An estimated program for a new sixth year is then added to the long-range budget. Each year this cycle is repeated to ensure continuity in planning and programming.

THREE MAJOR PROGRAMS

The capital budget document is developed around three major programs: (1) the program that defines educational facility needs, (2) the program of expenditures necessary to meet identified needs, and (3) the program of income to finance the required expenditures. Each area is related to and complimentary of the others. Effective capital planning attempts to balance programming, spending, and financing.

Educational facility needs. The first step in developing the capital budget document is to define the capital needs of the school district. This is the foundation of the total budget document. It outlines the facility needs that will be recommended for approval and funding during the planning period selected by the school. Priorities are a key consideration and should be decided upon in advance of printing the capital budget document. From the study of facility needs emerges the listing of recommended capital projects. Unless a project priority arrangement is desired, new schools are generally listed first by year needed. Each request for a new school should be supported with statistics showing

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enrollment pressures upon existing schools, use of existing schools, and the estimated total cost of the new facility. Regardless of the size of a school system, it is generally considered good practice to include in the document all the details necessary to support each capital project for which funds are being requested.

After requests for new schools are set forth in the budget, the requests for additions to existing schools should be listed by year needed. Considerable detail is also needed to justify an addition.

Recommendations for alterations and renovations of existing schools should be listed next by years needed. Usually the capacity of a school is not increased by renovation or alteration projects. Therefore, enrollment studies are not of prime importance unless renovations result in the use of existing classrooms for special subjects or unless confirmation of sustained enrollments is required. Instead, the relationship of the existing facility to the instructional program must be discussed in justifying the project. Qualitative rather than quantitative needs, therefore, are primarily at issue.

Maintenance needs are usually included in the long-term capital budget if their scope and cost are too great to handle in an annual budget. It is customary to require that the costs for a maintenance project exceed a minimum amount before its inclusion. Such amounts vary according to the total planned expenditures in a given year.

A phenomenon brought on by declining enrollments in many states and districts is the cost of closing the building, changing its function, or being divest of it. Closing can result in cost for mothballing and continued security supervision. A change of function to an administrative center, warehouse, community facility or other uses can necessitate some capital expenditures. The closing of a building, however, can mean that its removal from a long-range capital plan, thus reducing dollar needs. Careful planning is needed. Other options include the leasing or selling of a building, which can provide revenue for capital costs.

A final category of recommendations should treat capital projects related to, or supportive of, the educational facilities (including maintenance and warehouse building), capital programs for the total school system such as improved play areas, and adjustment of all buildings to meet a new code or regulation.

Expenditures. The second section of the capital budget document defines costs of recommended capital projects. The format of this section of the budget parallels the preceding section. It estimates costs for each recommended new facility, addition, alteration, or renovation; the cost of furnishings and equipment required for each capital project; and the cost of providing those items by the year needed, related to or supportive of the instructional program. It is recommended that only the total cost figure be listed for each capital project. The inclusion of detailed costs may prove economically imprudent — it may result in high bids and prices. They should have been shared internally of course, in order to gain support.

The cost estimates should include increases attributable to inflation. Depending on the economic stability of the times, allowing for inflation can be a simple task or a very difficult one. Consultation with architects as well as with leading trade journals is helpful.

Financing. The third major part of the capital budget document shows how recommended capital improvements will be financed. Several alternatives for capital improvement financing, discussed later in this section, are open to boards of education. The recommended methods should be indicated and explained in considerable detail. The anticipated impact

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of the preferred alternative on the tax rate should be noted. For example, if long-term bonds are to be sold to finance the capital budget, then the bond amortization schedule should be included. This practice will minimize the appropriate agency.

THE BUDGET CALENDAR

Successful development of the capital budget document may rely on the involvement of both professional educators and the lay public. This range of participation is especially important in school systems that require a referendum to approve the capital budget.

The mechanics of budget planning from isolation of need through implementation of approved projects consists of three major phases: (1) the preparation phase, (2) the review and adoption phase, and (3) the implementation phase.

Preparation. Preparing a capital budget requires a survey of existing educational facilities and includes an examination of current and predicted enrollment figures. A list of capital improvements can be developed from the results of this survey. The expenditure required for meeting total needs may be prohibitive. Therefore, priorities must be delineated and the annual and long-term capital improvement program planned. Each project to be included in the budget document is analyzed in detail, its cost is estimated, and a feasible plan for financing is developed. The detail, in this case, generally does not mean the development of educational and architectural specifications for capital projects. To do them often is nothing more than an exercise in priority or lack of funding.

It does not mean developing detailed cost estimates on gross planning figures. For example, a new building can be costed out only by determining the capacity, multiplying it by a square foot allowance per student, and then computing estimated costs. Assistance is available from architects, engineers, professional estimators, and, in some states, the state department of education.

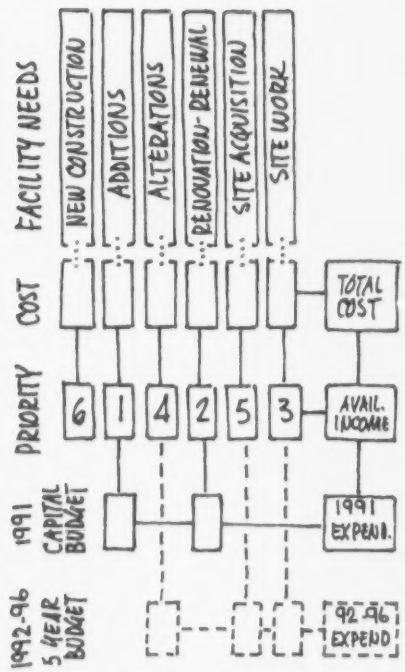
Review and adoption. After the budget document is assembled, it is submitted to the appropriate individuals and agencies for review. Usually the superintendent of schools and key administrative personnel make the first review. In fact, this review precedes the final compilation of the budget document. The completed document is usually referred to as the Superintendent's Budget of Recommended Capital Improvements.

The first review of the Superintendent's Budget is done by the board of education. In fiscally independent school systems, the board generally has final authority over the completed budget document. If the school system is fiscally dependent, then a review body over the board of education examines and finally approves the recommended capital improvement plan. This review process, if carefully planned, can be a valuable element of the efforts of the school to communicate capital needs to school patrons.

When the budget is adopted, the school officials must plan for implementation of the budget, usually beginning on the first day of the upcoming fiscal year.

Implementation. A smooth transition from the adoption phase to the implementation phase is a matter of efficient management. Phasing is the most critical task in effectively implementing approved capital projects. Proper phasing ensures: (1) facilities that are ready when needed, (2) avoidance of unnecessary disruption of the instructional program, and (3) bids within the budgeted funds.

Phasing should be considered during initial budget preparation. In large projects, it is usually possible to budget funds to defray planning expenses for the upcoming fiscal year, thereby



CAPITAL BUDGET PREPARATION

deferring construction expenses until the following fiscal year. Other advantages of phasing are that it allows time to thoroughly study costs, it helps to insure adequate funds for construction, it eliminates having capital on hand that is not being spent but upon which heavy interest is being paid, it allows the furnishings and equipment costs to be figured in an upcoming budget, and it provides time for the writing of an educational specifications document.

THE INDIVIDUAL CAPITAL PROJECT BUDGET

Successful educational facility construction programs are predicated upon accurate and complete budgeting of each individual capital project. Each item of expense that will accrue to the school district during the total construction program should be listed.

Following are major headings found in many project budgets. The nature of the project and the financial rules and laws applicable to the school district determine which one of these will be included in the budget for a single capital improvement project.

The educational facilities survey. Funds for financing the educational facilities survey pay for outside educational consultants, drawing of existing facilities, engineering feasibility studies, maps, printing services, travel to other school districts, and other costs incurred in connection with the survey.

Acquisition of land. This category includes the budgeting of surveys of land parcels, appraisal costs, engineering studies, topographical studies and test borings, legal fees, purchase price of the parcal, court costs if condemnation is employed, and the cost of removing existing structures from the site.

Fees and planning costs. Included here are fees to the architect. Other planning costs cover educational consultant fees, including the development of educational specifications, travel costs to study other school, and the cost of involving lay committees in the planning process. It is very important to reach a clear understanding on what services are covered by the architect's fee. The board of education may desire architectural services beyond what the normal fee will cover. Engineering services, cost estimating, and interior design, for example, may be beyond the scope of the architect's contract.

The construction contract. In some localities the building contract is termed the general contract and covers the complete construction project. In others there may be separate contracts for general construction, structural steel, plumbing, and drainage, and heating and ventilation. This is an extremely important part of the project budget and must be the subject of careful study.

Site preparation. This portion of the project budget includes all costs incurred in preparing the site for educational use. These costs include items such as utility service hookup (water, power, sewage, and gas), provisions for site drainage, planting and landscaping, creation of play areas, blacktopping, fencing, installation of play equipment, erection of the flagpole, illumination of both site and the exterior of the building, and miscellaneous improvements.

Furnishings and equipment. Some items of furniture and equipment are included in the general contract. However, all movable items are generally purchased outside the contract and must therefore be separately budgeted. This planning requires a comprehensive review of all needs. If consultants are employed to plan the furniture and equipment needs for the project, the cost of these services may be included in this category of the project budget.

Inspection (clerk-of-the-works). A resident inspector may be hired by the board of education to supervise the

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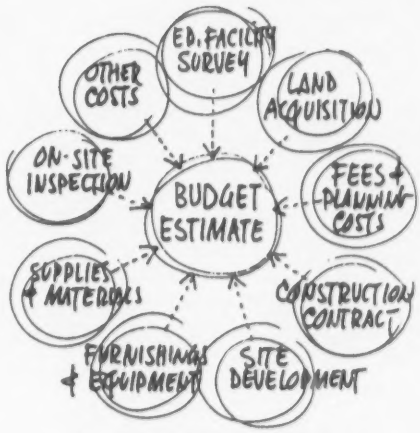

THE CAPITAL BUDGET FOR AN INDIVIDUAL PROJECT

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construction. The inspector's salary and expenses are included in the project budget. Often a trailer is used as an on-site office and requires heat, light, and telephone services. Sometimes the inspection costs are included in the category of administrative costs. Sometime this service is provided by the architect and made part of a contract.

Administrative and legal costs. These costs include advertising, postage and shipping charges, publicity, accounting, office equipment, and salaries for certain personnel in large school systems. Also considered here are insurance costs fees and costs for preparation of legal documents, handling of certain performance bonds, guarantees, examination of regular and special contracts, cost of bond sales, and fees for administrating property and land transactions.

Insurance costs. There are generally three types of insurance carried by the board of education during the construction program: worker's compensation, fire and public liability insurance.

Contingencies and other costs. This final category of the project contains funds held in reserve for emergency and unforeseen happenings that may arise during the building program. For example, rock found during excavation that was not indicated by the test borings may be encountered. Funds needed to cope with such unforeseen problems, as well as with change orders, are obtained from the contingency allowance.

A contingency fee should be set up for each project. Generally, a range of up to five percent of the estimated construction cost is considered a sufficient amount. Renovation projects may require an additional one or two percent unless accurate as-built drawings are available.

Expenses caused by the need for temporary heat during construction are an example of an item that could be carried under "other costs of construction." Certain change ordered and dedication costs may be financed from this account also.

FINANCING CAPITAL IMPROVEMENTS

Financing of capital programs has in the past been left almost exclusively to local initiative and resources; most is accomplished by bonding. As local debt services increase and process soar from inflationary pressures, school districts may find it more difficult to finance capital programs. A choice from several methods of financing must be made.

The Options

The options include: (1) pay-as-you-go, (2) state or provincial aid, (3) federal aid, (4) shared facilities, (5) non-tax revenue, (6) leasing, (7) lease purchase financing, (8) bond issues, and (9) state bonding authorities.

1. **Pay-as-you-go**. Some school districts pay cash for school construction. This method of financing may be achieved through one-time levies, after voter approval by referendum, or by accumulation of money in a reserve fund. Such plans are not legal in all states. Additionally, while interest costs are avoided, construction costs may escalate at such a rapid pace that no actual savings are realized by waiting until cash is in hand.

2. **State or provincial aid**. State or provincial aid may assume the form of either a grant or a loan. In the past grant programs were used as incentives to encourage school district reorganization or consolidation. Currently, state grants help provide property tax relief and equalization of school facilities resources at the local level. A trend toward more grants is not evident. The recent wave of judicial attacks upon state school finance programs has caused policy makers to recognize that serious interdistrict disparities in local tax capacity exist and that these inequities are severe in the area of capital ability. The New

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Jersey Supreme Court, for example, said in Robinson vs. Cahill (1973), that equal opportunity to education includes access to facilities that are equal.

The intent of state loan programs is to provide needed revenue to those school districts unable to sell bonds on the open market. Some school districts have a poor bond rating, are too poor to incur debt, or are unable to gain approval of referendum. For these reasons state loan programs have been beneficial — but the problem of repayment still persists for the poor district.

3. **Federal aid**. Although federal aid for school facilities is meager, there is some assistance for federally affected areas under Public Laws 815 and 874. Direct aid might be possible for vocational educational facilities. Some districts may be eligible for funds under the Public Works Employment Act of the National Energy Act. As with program support, federal capital funding is categorical in this nature.

4. **Shared facilities.** Libraries, physical education facilities, health clinical, auditoriums, and even dining facilities can be shared to reduce costs. This is done by either leasing to another agency, building these spaces in conjunction with another agency, or sharing first costs based on the pro rata usage of each agency.

5. **Non-tax revenue**. Methods of generating finances through this means include selling or exchanging property owned by a school district for other property where a gain is realized, selling or leasing ground or air rights over school property, and construction of educational facilities that have rentable space within the building. These methods may or may not be legal in every state.

6. **Leasing**. There are two types of leases, short-term and long-term. Short-term leasing may be used to acquire temporary facilities which help eliminate overcrowded facilities. Relocatable buildings are often used. Long-term is tantamount to the district buying the facility by paying a rental fee until the cost of the building has been paid.

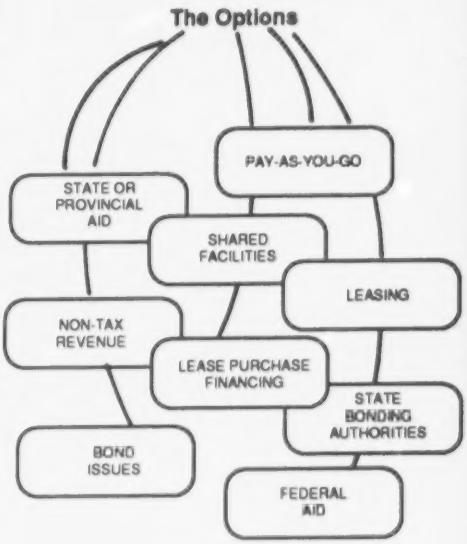
7. **Lease Purchase financing**. Many school districts have succeeded in reducing their capital costs for equipment and facilities through lease purchase financing, which are structurally similar to installment sales agreements and standard rental contract customarily utilized by corporations or individuals for these acquisitions.

Leasing is often a suitable and economical method of financing for capital assets that are too expensive to fund from just one fiscal period, but have useful lives too short to justify the issuance of long-term bonds. Leasing may be used as an alternative to bond financing in situations where voter approval for what is considered an essential facility is yet to be achieved but needed. No general obligation of specific revenue pledge is required; the school district only covenants to include the necessary appropriation for lease payment in its annual budgetary process.

Often, when a school district enters into a lease, the equipment vendor is also used as a financial institution. When this vendor offers a school the option to lease-purchase an item, the option may appear so attractive — compared to the burden of an outright purchase — that the school is not given an opportunity to focus on the cost of financing inherent in the lease payments. As a result, the vendor is not in competition with other alternatives when structuring the terms of the financing and may charge interest rates above the tax-exempt rates the school can attain elsewhere. Lease-purchase financing allows a public entity to minimize both the purchase price and the financing cost of an acquisition by accessing the appropriate market for each.

While the use of tax-exempt leasing has increased dramatically, the structuring and, in particular, the creation

Financing Capital Improvements



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of an adequate security for the credit, may be more complicated than that faced in completing a general obligation bond financing. In addition, the legal status of tax-exempt leases varies from state to state.

A lease-purchase financing is a contractual arrangement whereby a school district acquires assets. It is a purchase transaction for which payments are made in installments over time. The transaction is secured by the lease revenues and, where legally permitted, by the equipment or project being financed. The school district has exclusive possession, custody and control of the asset, as well as the responsibility for its maintenance and safekeeping.

The securities offered in the transaction will generally be Certificates of Participation or Revenue Contract Bonds, and are offered by the lessor (or an agent for the lessor) rather than by the school district as lessee. In this arrangement, the securities are backed by payments made by the school district, but are not direct obligations of the school district.

At the end of the term of the contract, and upon fulfillment of all contractual obligations, title to the equipment is typically transferred to the school district.

Alternatively, if title is passed at the outset of the contract, as may be required by state law, all liens are released upon satisfaction of all contractual terms.

Tax-exempt leases usually have a non-appropriation clause to avoid having the agreements classified as long-term debt under state or local laws. This clause allows a government lessee to terminate, without penalty except for loss of the leased property, a lease for which funds are not appropriated beyond the current fiscal year. In practice, this option has rarely been exercised as it would have negative implications for the school district and specifically on its future access to the capital markets.

8. **Bond issues.** Most school districts rely on the sale of local bonds to raise the funds needed to support capital construction. Usually bond repayment schedules range from 15 to 25 years in duration.

9. **Bonding-authority.** Some states impose usually low debt limits on school districts and the conventional method of local district bonding cannot provide enough monies. Either a state building authority or a non-profit local authority may float revenue bonds, build the school, lease the school (on a year-to-year basis), and turn the title of the building over to the school district once the bonds are retired. Long-term lease purchase plans also may be accomplished with private, for-profit companies. This method of financing, not legal in all states, has been used successfully in Pennsylvania.

BOND DEBT FINANCING

The greater part of school construction is financed through borrowing accomplished by issuance of school bonds. Attention, therefore, should be given to factors that can help determine the availability of funds and the cost of using this method of financing.

A bond may be defined as a formal written obligation specifying the conditioned under which a loan is to be repaid. The conditions include the fixed sum of money (the principal) that will be repaid, the dates of repayment, the rates of interest, and the procedures by which payments of principal and interest will be made. Bonds are usually issued in denominations of $5,000. Two types of bond issues are used — term issues and serial issues. In term issues all bonds reach maturity at the same specified time. Some states allow school districts to create a mandatory *sinking fund* by which taxes collected for bond retirement purposes are invested and draw interset until a portion of the bonds are redeemed on an annual basis.

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The more prevalent type of issue is the serial bond, which means that different amounts of bonds reach maturity each year during the life of the issue. The amount of interest and principal due each year can be structured to allow stable, long-term fiscal planning.

Bonds of state and local governmental units, including school districts, are classified as municipal bonds. The interest yield to the investors is tax-free, which generally enables government units to secure more favorable interest rates than private borrowers can obtain.

School building bonds that pledge the full faith and credit through their taxing authority are termed general obligation bonds. Bonds sold by a bonding authority that are to be repaid from earnings of a public enterprise, such as a toll road or college dormitory, are classified as revenue bonds.

General obligation bonds ordinarily command lower interest rates than revenue bonds because of the greater degree of security for the investors. Revenue bonds can be used for school construction purposes by an authority created with the powers to issue such bonds. In some states, this method can eliminate statutory debt limitations or the need for voter approval. The funds for principal and interest payments accrue to the authority as rents paid by the user of the facilities.

Voter approval. Voter approval is required in the majority of states for the issuance of public school general obligation bonds. Often it is difficult to secure voter approval, particularly if the school district is not engaged in a continuous program for the development of public understanding and support. Moody's Investor Service suggests several obstacles to public support of bond issues: unwise scheduling of the election, failure to present as lucidly as possible the necessity for the issue, and failure to use available media.

Interest costs. Interest costs on municipal bonds are determined by the character and financial capacity of the issuer, the size and term of the issue, and the market conditions or availability of investment capital at the time of the sale. On a twenty-year amortization of a million dollars, a variation of one-eighth of one percent in the interest rate will significantly increase the interest costs. It therefore becomes very important to secure the best possible interest rate.

Financial capacity and character of the issuer. Potential investors are interested in the community's ability and willingness to retire its debt. The financial capacity of the issues has an important bearing on the interest rate that will be obtained.

An important factor is the amount of taxable existing debt and its ratio to taxable wealth. If total debt approached ten percent of the taxable value of the property, interest rates are likely to be relatively high. Overlapping debt of other governmental agencies is also considered, as are the probable future capital needs of both school and civil governmental agencies of the community.

Ability to retire debt is dependent upon sources of revenue available to the school district. Although seldom available, state grants for debt service or state guarantees of debt would reduce the risk to investors and should favorably influence interest rates. Usually the local property tax provides debt service funds; therefore, the size of the tax base relative to the number of pupils and the total population is quite important. Also, the composition of taxable property with respect to diversification among personal property, and industrial, residential, commercial, and agricultural elements is another influence on interest rates.

The trend of tax rates indicates whether the community is fiscally conservative, willing to support schools and other governmental functions, or is perhaps overextending itself. Rates

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are analyzed with respect to assessment procedures to determine effective tax rates or the ratio of the tax burden to taxable value of property.

Interest rates are adversely affected by past defaults of financial obligations, history of school on civil referenda defeats, litigation on bond issues and embezzlements. Tax collections considerably less than amounts levied indicate that citizens and governmental officials are indifferent toward their responsibilities. This negatively influences interest rates.

Length of term. Interest rates are higher as the length of term of the bond issue increases. Bond issues should be kept as short as is feasible. If it is necessary to issue bonds for long terms, provisions should be made for earlier retirement of debt if and when economic conditions permit. The provision for calling bonds (known as the redemption feature) prior to their original due date is of an advantage only to the issuer; therefore, slightly higher interest rates are bid on bonds with early call features.

Timing of the issue. The bond market is highly competitive, and supply and demand factors prevailing at the time of the sale of bonds affect interest rates. Short supply of investment capital coupled with a large volume of bonds mean that interest rates will rise.

Competition exists among governmental issues for investments capital, and monetary conditions in the private sector of the economy are important determinants of the general level of interest rates. The school district has little or no control over general economic conditions, but it might be able to arrange its bond sales for a day or week when no unusually large issues are competing. The "Bond Buyer," the "Wall Street Journal," and financial pages of large metropolitan newspapers are sources of information with respect to the status of the bond market. Bond dealers and investment bankers also can furnish valuable guideance on the most suitable time to market bonds.

Necessity for adequate legal assistance. The necessity for competent legal services when planning and administrating a bonding program cannot be overemphasized. Competent counsel is needed to meet the legal requirements existing in a particular state, and the attorneys may assume responsibility for directing school officials through theses steps. If a local attorney is used, he or she should receive counsel from nationally recognized bond attorneys who must approve the legality of an issue if it is to be favorably received by the major bond buyers. It may be advantageous to a school district to work directly with a nationally known bond counsel.

Bond rating. Ratings serve investors as general measures of the quality of an issue. Three major rating firms are nationally recognized: Moody's Investors Service, Standard and Poor's Corp., and Fitch Investors Service. Nominal fees are charged by bond rating firms, but the value accruing to the school district by having their bonds rated may be well worth the expense.

Ratings are contingent upon full disclosure of required information with respect to economic conditions in the community, its credit history, debt pattern, and other financial factors.

As a general rule, rated bonds will secure a more favorable interest rate than nonrated bonds Many school bonds are not rated either because the outstanding debt is too small or because sufficient information is not available to the rating agencies.

Moody's rating scale evaluates bonds from high quality to high risk; most school bonds are rated from Aaa down to Ba with the majority rated Aa, A, or Baa. Standard and Poor's uses a similar scale with AAA, AA, and A indicating the highest quality and C, DDD,

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and DD representing poor quality bonds.

Full cooperation should be given to the rating firms to secure to best possible rating and thereby lowest interest cost.

Public sale of the bonds. With the assistance of a fiscal advisor, bids on school bonds can be encouraged by providing information to potential investors. Advertisements in publications such as the "Bond Buyer," "Wall Street Journal" and regional and local financial chronicals provide opportunities for broader participation in the bidding. Pertinent data concerning the issue and the community should be forwarded to underwriters and potential investors.

A prospectus can include most of the detailed information about the school district and the community needed by investors to facilitate intelligent preparation of bids. The prospectus should describe the community's social and economic characteristics, nature of industry present, population data, assessed valuation, total tax levy, tax rates, tax collection record, total debt analysis, and the amount of state aid. If there are particularly large taxpayers such as a public utility or an industrial plant, the assessed valuation and a description of these properties as tax entities should be provided. Some estimate of future need for school facilities should be provided. For example, the fact that a district requires no additional classrooms in the near future could be very important.

The debt of other public bodies (fire, sewage, water) that overlap the school district should be presented in the prospectus. Complete details on the bonds presently being offered, the maturity schedule, the place of payment, and the provisions for the redemption of these bonds before maturity should be described in the prospectus.

Negotiated sale vs. competitive sale of the bonds. As a result of substantial bond market volatility over the past few years, more and more governmental entities (including school district) are negotiating the sale of their bonds directly with an investment banking firm having underwriting capacity. Negotiation has potential benefits. Because of the involvement in pre-sale origination and distribution the negotiating underwriter may have better knowledge of the issue, issuer and market for the bonds than a competing bidder might have. There are several reasons for this informational advantage. First, bidders do not receive renumeration for their pre-sale service unless they win the bid, which tends to inhibit pre-sale marketing activities. Second, bidders have no influence over, nor involvement in, the originating of the issues and consequently may have less knowledge of the issue and the issuer than does the negotiating underwriter. In particular, if an issue faces high uncertainty regarding investor demand, then a bidder (1) faces high underwriting risks and (2) may be unable or unwilling to estimate accurately the minimum yields that will clear the market.

When an issue is of lesser credit or faces higher demand uncertainties the negotiating underwriter can improve the flow of information which may reduce underwriting risk and may enhance the underwriter's ability to sell bonds at lower yields relative to a competitive bidding underwriting. Any resulting decrease in spread or yields causes a corresponding decrease in interest cost.

A roster of past investors and other interested parties should be maintained on a mailing list and kept current. Copies of the prospectus should be sent to these possible investors.

FACTORS AFFECTING VOTER APPROVAL.

Research finding on bond referenda may be helpful to school districts anticipating elections. Past research shows that often the following steps

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will enhance the chance of winning at the polls.

THE STEPS FOR WINNING AT THE POLLS

1. *Develop a Strong Public Relations Program*
   a. A public relations program should be ongoing and year-round.
   b. A top level administrator should coordinate the program.

2. *Pre-Planning...*
   Study and Analyze
   a. Study and analyze for at least one year.
   b. Study the need through the use of a broad based committee.
   c. Study the timing, avoid tax bill days or mailings, run a special election, avoid general elections.
   d. Study all alternatives, their costs and their advantages/disadvantages.

3. *Study of District Historical Data*
   a. Study the past election data — precinct by precinct.
   b. Study the strategies used in the past bond campaigns.
   c. Determine what caused the bond issues of the past to fail and what caused them to succeed, find out what people were in favor and what people were against.
   d. Look at the age distribution of voters in each precinct, identify the turnout of each group of voters at the last bond election, identify the people from each age group that worked for the bond issue.
   e. Look at the voter statistics, find out what percent of the voters voted, compare the number of parents voting to the number of parents who have children in school and to the number of parents who belong to PTA's and Booster Clubs.

4. *Survey Your Community*
   a. Ways to survey your community include telephone surveys, mailings, and interviews, Telephone surveys are the quickest and cheapest.
   b. There are three questions to ask: What do you like about our schools? What would you like to see improved in our school district? Speaking as a voter, would you likely vote yes? Try to ascertain as much attitude information as possible.
   c. Find out what issues are both related and not related to the election. Identify hidden agendas so as to address them. Find out who the "yes" votes are.
   d. Do a pre-election survey before the Board makes a final decision, give the facts. Ask respondents to answer "yes" or "no" and then follow-up with a second question as to why they feel that way. This information will arm you with the issues and the hidden agendas so that you can deal with them up front

5. *Develop Election Campaign Strategy*
   a. It is imperative to have unanimous board support.
   b. All staff members must be informed, custodians, cooks, nurses, secretaries, and all school personnel are very important to the success of bond issues. All staff members, like speakers, should be armed with information, because their opinions will be sought.
   c. Run an intensive campaign for the bond election for no more than six week prior to the election.
   d. Use all positive data available, test scores, awards, good programs, etc.
   e. Use the grass roots movement, train teams of speakers for a Speakers Bureau and armed with transparencies and scripts.
   f. Identify a theme such as "Vote for Students" so that it is centered around students or kids.

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g. Formulate an advocacy group.

6. *Conduct Special Voter Registration*
   a. Conduct special voter registration drives.
   b. Segment your community by school and by block, solicit PTA's and parents to register people who are not registered.

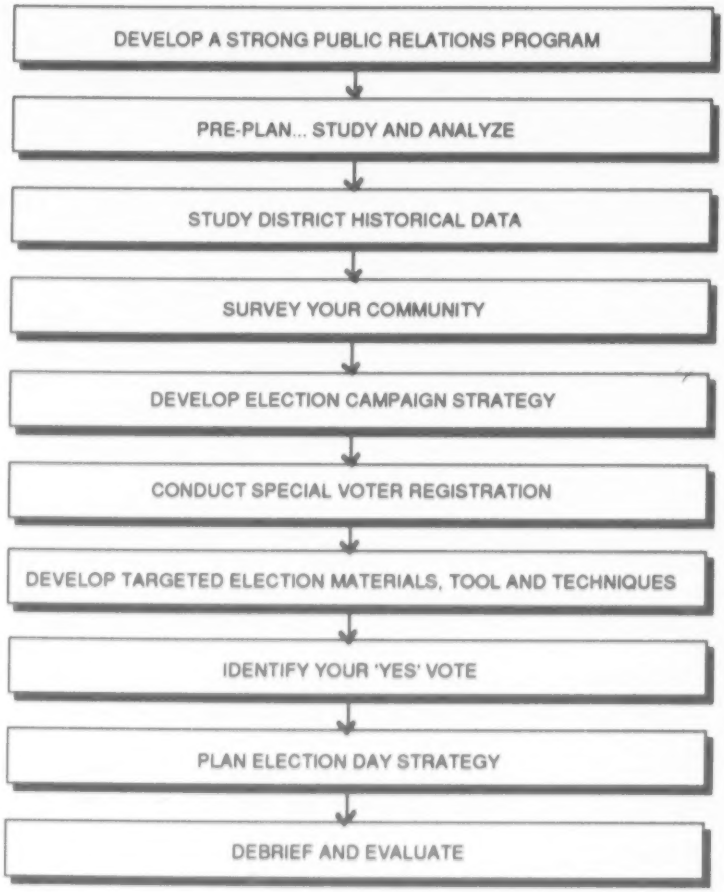
7. *Develop Targeted Election Materials, Tools and Techniques*
   a. Show people a specific benefit for them.
   b. Identify situations, when to use and what information to emphasize, i.e., appeal to senior citizens would be different than appeal to parents.
   c. Include something for all.
   d. Be ready to answer the question, "What building spaces are essential, what are important, and what are desirable?"

8. *Identify Your "YES" Vote and Plurality Needed for Victory*
   a. Look at each precinct and identify your "yes" voters.
   b. Go after the "yes" voter, don't worry about the "no's".

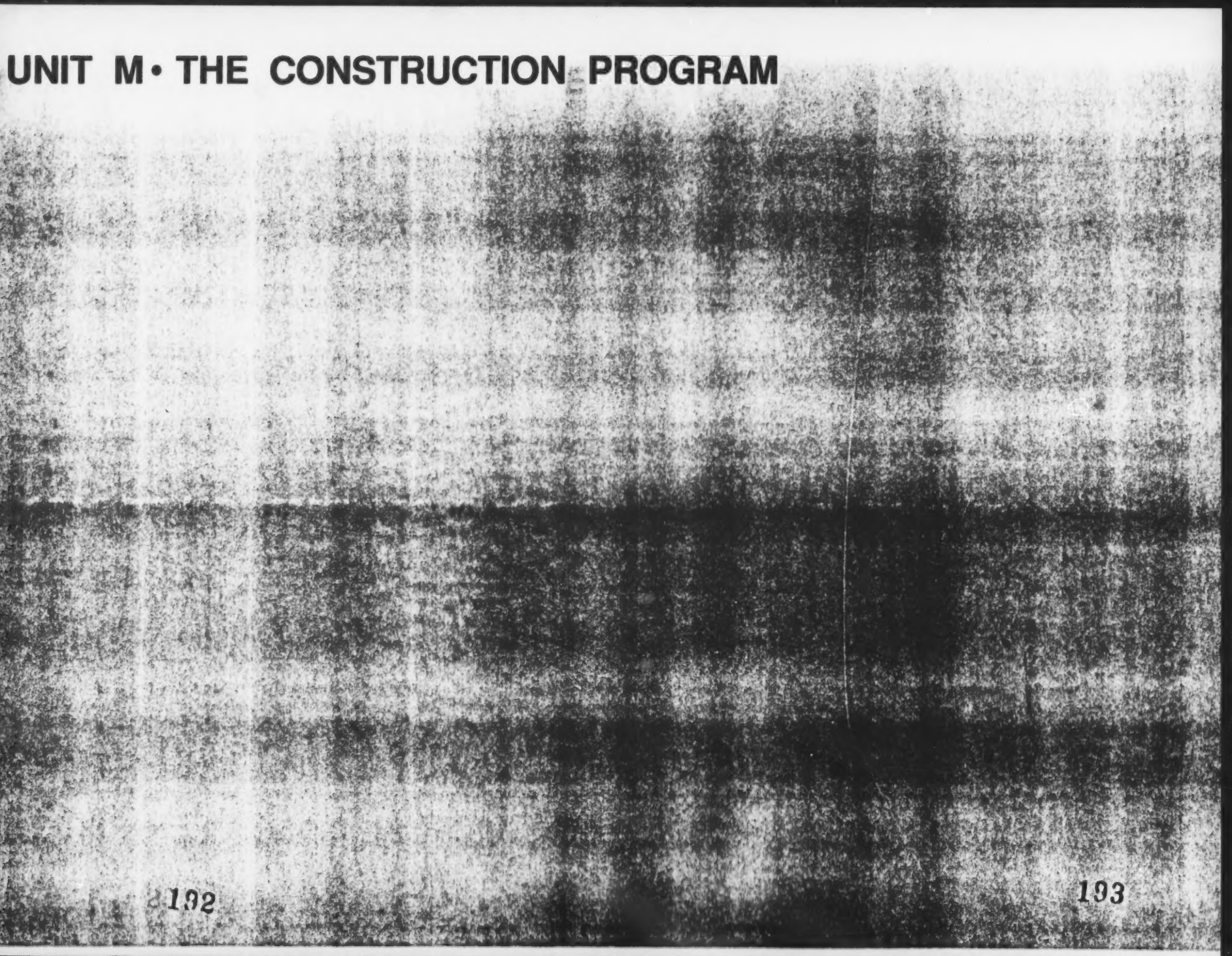
9. *Plan Election Day Strategy*
   a. Get people to the polls, call every "yes" vote through volunteer callers.
   b. Do poll watching, look at the voter statistics, watch the voter turnout.
   c. Check the count at 10:00, 12:00, and 4:00 p.m.
   d. Have an organization available as the voter turnout comes in you can rally the troops to get more voters out.

10. *Debrief and Evaluate... The End of the Beginning*
    a. Summarize the election whether you win or lose. If you lose, it will be helpful in another campaign. If you win, you can record your successful efforts for the future.

Steps for Winning at the Polls


DEVELOP A STRONG PUBLIC RELATIONS PROGRAM
PRE-PLAN... STUDY AND ANALYZE
STUDY DISTRICT HISTORICAL DATA
SURVEY YOUR COMMUNITY
DEVELOP ELECTION CAMPAIGN STRATEGY
CONDUCT SPECIAL VOTER REGISTRATION
DEVELOP TARGETED ELECTION MATERIALS, TOOL AND TECHNIQUES
IDENTIFY YOUR 'YES' VOTE
PLAN ELECTION DAY STRATEGY
DEBRIEF AND EVALUATE

UNIT M • THE CONSTRUCTION PROGRAM



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THE CONSTRUCTION PROGRAM

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THE CONSTRUCTION PROGRAM

This unit contains an overview of administrative and legal considerations facing the school district involved in the construction of an educational facility. The following topics are discussed: the legality of construction, building codes and regulations, advertising and bidding the project, award and execution of construction contracts, contractors and sub-contractors, construction administration, payment of contractors, construction management and design/build.

THESE ACTIVITIES are regulated by law and/or require the use of legal counsel:

- Determining school construction needs.
- Estimating the taxing power of the school district.
- Arranging for funding of the school construction debt.
- Approving, issuing and selling bonds.
- Validating bond recitals or transcripts of bond proceedings.
- Building budgetary procedures.
- Financing capital outlay by other methods.
- Selecting and acquiring school sites.
- Selecting and contracting for professional services.
- Preparing programs of educational and community requirements.
- Processing building plans.
- Preparing and accepting bids for construction.
- Validating school building contracts.
- Dedicating and accepting the public school building.

SCHOOL CONSTRUCTION AND THE LAW

Handling legal issues is an inevitable part of any school building project. Site acquisition requires title clearance and transfer, and in certain cases, may involve condemnation proceedings. Most building programs require authorizations for bonding, public legal notices, review of bids, award of contracts, and approval by state and local authorities before certain phases of the building project can proceed. These activities are controlled by law and sometimes require approval of the electorate.

Boards of education must exercise their authority with due regard for provisions of state legislatures and requirements of state departments of education. When unique or complex problems occur, the legal divisions of state education and/or justice departments may be consulted for guidance. Most states also can be expected to give day-to-day advice on interpretations of statutes and regulations. It is important, however, that boards of education secure additional legal advice by employing a competent attorney. Legal counsel is usually obtained by (1) hiring a lawyer as a member of the local education agency administrative staff—thereby insuring full-time availability of legal advice or (2) retaining legal services as circumstances require. These two forms of service may be used in combination.

Authority of States. School boards derive their authority from statutes of the state and can exercise no powers except those expressly granted or those which result from necessary implications of the grant. Districts may be organized or reorganized by state legislatures. Cities and towns may not expend funds for school construction unless expressly authorized by statute. It is therefore important for school boards to be aware of the legal implications of their acts and responsibilities.

CODES AND REGULATIONS

Building codes and regulations should protect the public against inadequate design or construction. The extent to which codes and regulations govern the design and construction details of an educational facility varies among localities and depends as much upon degree of enforcement as upon severity of the regulations themselves. National codes govern most aspects of building construction and design. In addition there are state laws, state department of education regulations, and codes and ordinances adopted by local units of government. Many agencies adopt national regulations by reference.

The nature of law is such that no government unit can adopt standards that are less restrictive than those of a higher authority. Consequently, the locality that has a city code, in addition to state and national codes, imposes additional restrictions upon the school district, architect and contractor. As a result, a facility built in a given area may be required to be "more safe" than a similar structure located elsewhere.

The impact of the somewhat few locations where comprehensive codes are enforced is felt nationally because of the importance of these markets to contractors and manufacturers who adopt procedures and produce equipment for general use. This practice often provides a measure of enforcement of standards in all construction.

National codes are not controlling in themselves but require adoption by a state or local authority. Their value lies in the uniformity made possible by widespread adoption.

The form, content and enforcement of building codes and regulations vary. Requirements generally deal with the physical structure of the building, and they may apply to repairs and alterations of existing buildings. Codes are applied through ordinances and statutes providing for administration, fees, penalties, etc. Inspection procedures both during and after construction vary according to adequacy of staffing and financial support. Severe violations are usually handled by administrative boards or the courts.

Building codes and regulations can have a major impact on the cost of a project and freedom of design. This effect is most severe when codes treat material rather than performance specifications. Therefore, school districts should contribute to the updating of codes and regulations so that their applications supports, not obstructs the educational process and design innovations.

ADVERTISING AND BIDDING THE PROJECT

Advertising for Bids. With the completion and approval of the final working drawings and specifications (ususally termed the bidding documents), a school project is ready to be released to contractors to obtain tenders or bids. Most school districts follow the practice of advertising and obtaining competitive bids as a matter of law. If poorly handled, advertising and competitive bids can result in higher building costs than such a competitive system should produce. Carefully prepared bidding documents and detailed procedures are necessary to obtain all the potential benefits of this system.

The requirements for advertising the project are usually met by inserting an announcement in a local daily or weekly newspaper or in the legal news publication of the locality. In addition, the architect should prepare a list of firms to be invited to bid. Many localities have a builders' and traders' exchange that maintains a plan room where sets of drawings and specifications are made available to all contractors, subcontractors and suppliers. Inviting firms to bid, whether by telephone or by mailing an "Invitation to Bid" is the surest method of announcing to the construction industry that a school project is out for bid.

Obtaining Bids. The advertisement for bids should state the time and place of receiving the bids; where the bidding documents may be picked up and the deposit required; a brief description of the project; and any conditions that are attached to preparing, submitting and opening the bids. A large school district may wish to develop its own advertisement; however, a form is available from the American Institute of Architects.

The architect is familiar with the project and the estimating practices of local contractors and suppliers and can estimate a reasonable time for bidding.

The selection of the date when the bids are to be received should take into account other projects on which tenders are being requested, both in the immediate locality and in nearby areas. A failure to consider the other projects with which the contractors may be involved may result in high bid figures, and sometimes, to the embarrassment of everyone, no bids at all. If, after a project is out for bids, it is discovered that another project is competing, a change in the due date may be considered. Occasionally, the firms intending to bid on a school project will request an extension of the due date. Such requests should be carefully considered and granted if possible, since they usually result from a contractors' inability to obtain quotations or insufficient time to estimate those work divisions to be done by the contractor's own crews. Failure to extend the due date may again result in high figures or a lack of bids.

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WHAT DO BUILDING CODES REGULATE?

- Structural and foundation loads and stresses
- Construction materials
- Fireproofing
- Building heights
- Ventilation and air conditioning
- Plumbing fixtures and installation
- Heating system construction and equipment
- Electrical installation
- Elevator and escalator construction and safety devices

CONSULT THESE federal, state and/or local agencies and codes:

National:

- Building Officials Conference of America
- Occupational Safety and Health Act
- Uniform Building Code
- National Electric Code
- National Plumbing Code
- Uniform Mechanical Code
- Federal Energy Administration
- Environmental Protection Agency

State and/or Local:

- Earthquake Safety
- Hurricane and/or Tornado Safety
- Fire and Panic Safety
- Health and Sanitation
- Air Pollution Control
- Noise Pollution Control
- Water Pollution Control
- Aeronautical Safety
- Highways and Streets Safety
- Accessibility Requirements for Physically Handicapped

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An evening submission time has become common. The bid registry (or depository) system has been developed to avoid the problems of last minute compilation of bid figures. Under this system, the contractor is given time, usually 24 hours, to evaluate tenders from the subcontractors and suppliers. For this system to work, there must be a managing organization available that is trusted by the bidders.

AWARD AND EXECUTION OF CONSTRUCTION CONTRACTS

After bids have been received and examined, contract awards can be made by a resolution passed by the board of education. The form of the contract document is generally prescribed by the local or state board of education or by state statute. It is important that the attorney for the board of education examine the contract and approve the procedures under which the award is to be made. It is also imperative that the board understand its responsibilities and rights under the law. Complete implications of the contract must be understood by all parties concerned. Some areas of particular interest are:

Negotiation. Negotiation is the act of establishing the terms of the agreement. The parties discuss the proposed terms of the contract before the final writing is made. This is done by oral discussion or by an exchange of written proposals.

In contracts for school construction, the plans, specifications, and bidding procedures determine the terms of an agreement. The general rule is that the contract subject of the bid cannot be changed in substance without rebidding. Negotiations are permissible to clarify or correct the agreement and change orders are acceptable if they do not constitute a new work agreement. New work must be rebid in compliance with the laws.

Change orders. A board of education has the power to issue change orders for any contract that it had the authority to enter, but only where it acts within its authorized limits. Where statutes limit the freedom of public bodies to make new agreements, authorized procedures must be strictly followed. Where statutes are not limiting, the force of law depends on the specific contract. Many contracts contain provisions requiring written change orders. The project architect may act as the authorized agent of the board to clarify or modify plans and specifications within the terms of agreement to construct a school building.

Agreements for entirely new work are not within the terms of the original written agreement to construct a public school. All new agreements must comply with the statutory procedures of formal notice, bidding, and awarding of contracts by the board. The line is not easily drawn between entirely new work and an acceptable modification, clarification, or addition of an omission within the contract. These distinctions require careful consideration of the nature of the work, the contract, and the statutes in force as well as the acceptable customs and business practices acknowledged by the courts.

Breach of contract. Any legal duty of a contract is discharged or terminated by full and exact performance. Full and exact performance pertains not only to the character, quality, and amount of work, but also to the time within which the work is performed.

When the contractor asks damages for a breach of contract for non-payment, he must prove an action or inaction by the defendant that constitutes a breach. The primary contractual duty to render a promised performance continues to exist even after a breach has been committed by one party. The duty to make compensation after breach is a secondary duty. Payment of money by the school district can be rendered after the exact due date and the payment acts as a discharge of contract whenever paid. However, the obligation for the breach continues to exist. The creditor can assent to receive the

payment as satisfaction and dismiss the suit.

When the school district specifies an exact time for completing the construction of a building, it may claim damages resulting from the contractor's failure to perform on time. The courts will demand evidence of damages resulting from the tardy performance. Special damages could include rented classroom space, transportation of furniture to the rented spaces, storage charges for furniture and equipment delivered but not installed on school property, and any other expenses caused by the contractor's failure to perform within a specified time. School districts are obligated under the general rule of law to mitigate any damages.

Substantial Performance. Damages will not be awarded if it is judged that the terms of agreement have been substantially performed. When a building can be put to the use for which it was intended even though comparatively minor items remain unfinished to make the building conform to plans and specifications, substantial performance may be satisfied.

Conditions and Promises. An important distinction exists between a promise and a condition in a contract. A promise is an expressed intention to render a future performance. A condition is a fact or event and not an expression of intention nor an assurance nor a promise that the conditioned fact or event will occur. A promise creates a legal duty in the promisor and confers a right on the promisee. A condition is a modifying factor and creates no right or duty.

The first step in contract interpretation is to determine if the expression in the contract was a promise creating duty or a condition dependent upon some performance by another or some future event. Breach of contract occurs upon nonfulfillment of a promise and creates a right to damages. Often the contracting parties do not make this logical distinction and the court must interpret the contract in the manner that is most reasonable and just.

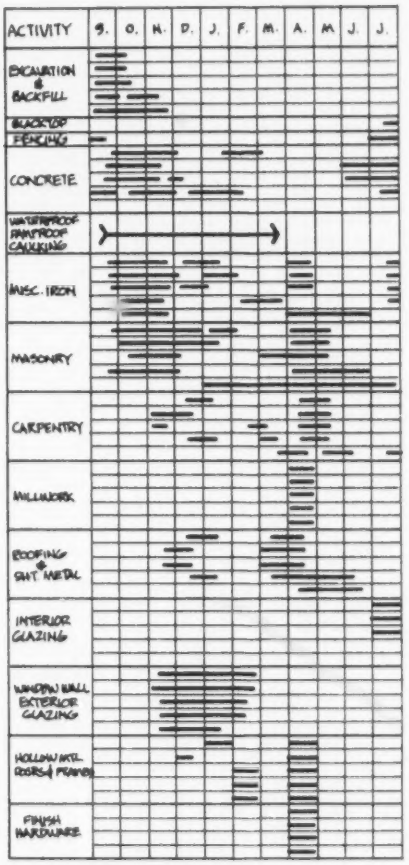
Arbitration. Arbitration is the submission of a disputed matter to a private, unofficial person or persons selected in a manner prescribed by law or agreement. The usual method of selecting arbitrators for building contract disputes is to have each side select an arbitrator who in turn select a third arbitrator.

A provision for arbitration is included in most contracts. The provision for arbitration of disputes as a condition precedent to any right of legal action may be modified, rescinded or waived by agreement or by the conduct of the parties. Generally, agreements to settle disputes by arbitration cannot be revoked by the parties after the arbitrators make findings and awards unless the arbitration can be shown to have been fraudulent or beyond the arbitrator's authority. Arbitration clauses are unenforceable when they attempt to prevent or deprive a court of its power to act in a case.

CONTRACTORS AND SUBCONTRACTORS

It is a common practice for contractors, either with the bid or following bid opening, to submit to the architect a list of subcontractors that they propose to employ on the project. The list of approved subcontractors is a binding part of the contractual relationship and, to a significant extent, it sets the level of quality that can be expected on the project.

It is the contractor's responsibility to develop a schedule of progress for the project. The schedule establishes when and for how long the various divisions of work occur. A bar chart is the most common form used by contractors to depict a progress schedule. If critical path scheduling is required, the contractor must work within the framework established in the precontract or prebid schedule.



CONSTRUCTION PROGRESS SCHEDULE PARTIAL

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The architect is responsible for insuring that the contractor holds regular meetings of the subcontractors. These meetings, commonly referred to as job meetings, are the key to successful adherence to the schedule. Most problems related to the project can be resolved here. The clerk-of-the-works representing the school district is present at all job meetings. The architect takes minutes of the meetings and distributes copies to all concerned. In some cases, the contractor takes minutes.

CONSTRUCTION ADMINISTRATION

After the construction contract has been awarded, the architect observes the project on-site to protect the owner against defects and deficiencies in the contractor's work. Inattention to the quality of the contractor's performance can result in chronic mechanical, structural and maintenance problems that detract from an otherwise well-designed school.

In theory, the architect turns the contract documents over to the contractor, who, in turn, performs in accordance with these documents and claims completion of the work. The architect then inspects the facility and, if required, submits a listing of deficiencies, commonly called a punch list, to the contractor for correction. Upon satisfactory reinspection, the architect recommends payment which the owner then forwards to the contractor.

In practice, the best inspection is continuous inspection. Without it, errors may occur that are costly or even impossible to correct after completion of the project. It is also true that, due to the various complex specialties involved in construction, no one construction administrator can effectively verify that the contract documents are being or have been fulfilled.

According to AIA contract documents, the architect is not responsible for exhaustive or continuous construction administration. Only about 20 percent of the architect's fee is traditionally allocated for construction administration costs. This makes it difficult to maintain continuous comprehensive construction administration. The best way for a school board to insure that the necessary construction administration occurs is to pay the salary of a full-time, on-site representative from the architect's firm to perform these functions. If this is not acceptable, the school board can hire a clerk-of-the-works. This expense is only justifiable for large, complex projects or numerous small projects occurring simultaneously. A clerk-of-the-works insures that the architect has a construction administrator on the premises at the proper times and that the inspections are performed in a manner that confirms the reported results. He supplements, not replaces, the work of the architect's employees.

A third option open to the client is to hire a construction management firm that has expertise in the building industry and building processes. A construction manager serves as a professional liaison between owner, architect and contractor.

PAYMENTS

Payments to contractors are commonly made on a monthly basis. The contractor submits a statement to the architect, who in turn attaches a certificate of payment if the request is approved. The request is forwarded to the school district where it may be checked by the contract management unit. The request for payment often follows a time-consuming route. The district which is prompt in making payments may be rewarded with lower bids.

Withholding payment. It is common practice for an amount (usually 10%) to be retained on each request for payment. This practice is questionable since it places a financial burden on the contractor, particularly if he has completed the work on which the amount is withheld. It would

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perhaps be more fair to retain an amount related to work yet to be done. There is a trend toward reducing the percentage to three to five percent particularly where critical path scheduling is used. Thus the contractor may be assured a lower retained amount if he stays on schedule.

Funds withheld by the board until a certificate of final acceptance from the architect is received may be used to rectify deficient work and damages for delay in completion. In some states, labor and material claims are permitted liens of the highest priority against unpaid funds belonging to indebted contractors. Statutes occasionally require a public body to retain funds for labor and material liens. Funds thus retained are in the nature of a trust for the benefit of unpaid laborers, materialmen and subcontractors.

In the absence of contractual or statutory provisions, a school district may not withhold funds belonging to a contractor even when it receives notice of unpaid claims from materialmen and laborers. When the performance of the contractor is satisfactory, the board of education is required to make the contract payment in full. Correction of inadvertent omissions or inappropriate workmanship also obligates the district to make payments in full.

Usually the architect's certificate of approval determines the legal standard of performance. This judgement will usually satisfy the contractors and the board of education, but when the architect's judgement fails to satisfy the parties to the contract, the differences are settled by arbitration or negotiation, and finally, if agreement cannot be reached, by a court of law.

Payment for extra work. Most building contracts provide that there shall be no payment for extra work without a written order from the architect. If the contractor performs extra work knowing that the owner insists that no extra pay will be made, he is a volunteer and his claim for an extra payment will not be sustained by the courts.

Payment in part. The owner may be dissatisfied and allege that the contractor performed defective work or that the work is not according to the contract, plans, or specifications. When the owner pays a part of the amount due, the special conditions and the intent of the parties determines the effect of the payment. Any changes in the contract must be based upon the legal standard, and each party must agree on the effect of the change before the conditions of the original contract may be discharged.

A payment of part of the contract price due of an undisputed debt does not operate as satisfaction of a contract. A different result is reached if the price or debt is liquidated or disputed. Liquidated debts are settled by the agreement of parties or by the operation of law. Part payment by the owner with the understanding by the creditor and his assent by accepting the part payment as payment in full, discharges the owner of his entire debt. When a part payment is accepted, the creditor has extinguished a duty of the owner by complete contract which is furnished and executed. If the part payment is to be made at a later date, the contract is incomplete and subject to change by either party at any time before the part payment of the creditor executes the contract as a complete discharge of duty to pay in full.

Tender of payment. The refusal by the contractor of a proper tender of money due him does not discharge the duty of the owner to pay the contractor for satisfactory work performed; the proper tender of money does prevent the contractor from seeking damages for a breach of duty by the owner to pay his obligations. A suit by the contractor to obtain the interest for nonpayment at the proper time, however, would not be allowed by the courts. Neither can the contractor

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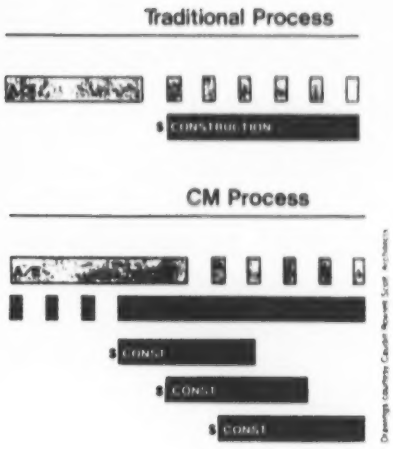

enforce the surety to pay the debt because of his own act of refusing to accept payment.

CONSTRUCTION MANAGEMENT

Construction Management (CM) is a comparatively new way to get buildings built. It brings professional rather than entrepreneurial direction to the entire design and construction process. CM differs substantially from conventional project organization in which leadership is split between the architect and the general contractor. With construction management, there is continuity of leadership from the beginning of the project through occupancy.

The construction manager makes significant inputs relating to cost, quality and time to the architect during the design process. Competitive bidding is still employed for what are traditionally the subcontracts to the general contractor. Under CM, these become prime contracts to the owner. The various contracts may be bid at once, but are often phased or bid at different times. This is particularly true when time is short and fast-track scheduling techniques are employed to complete the project. Certain contracts are then bid in advance of others, so that work can get underway on construction elements that must be completed first.

The prime advantage of the conventional system is that the price of the project is known prior to authorization to proceed with construction. However, if bids are high, the entire process may be delayed or have to be completely redesigned because of these overages. Using CM, the various bids can be compared with budget allocations to make sure that the project is within the budget.

There are a number of other advantages to the construction management process, including the fact that bidding can be organized in packages that reflect the market conditions. In other words, bids can be taken early on certain components, combined for multiple project programs, or in the case of large projects, subdivided to make the bid packages more attractive and competitive on the market. The construction manager's job is not only to provide input relating to time, cost, and quality to the architect, but to manage construction. He organizes the schedule of construction and manages the input of the various subcontractors just as the general contractor would. General conditions on the site are either bid out to a small contractor or can be done on a cost/plus basis.

Many processes involved in construction management are similar to those employed by general contractors in doing work for private clients where the client is part of the decision making and the project gets underway before the final prices are in on all the subsystems of the building. The primary difference in construction management is that it has been employed on public jobs, in which all parts of the job are put out to bid in order to meet the legal requirements of the public agencies involved. Contractual arrangements vary a good deal, with some construction management groups favoring a guaranteed maximum price and others not.

DESIGN — BUILD

This concept combines the architect, engineer and other professionals with the builder to form a "design-build" team. In private industry selected teams are invited to submit total cost bids to design and construct a building or buildings based on a program and criteria established by the owner. Each team submits a preliminary design of the contemplated project with a cost to construct the project in accordance with the design. The client then has the opportunity to select the team and the design he wishes.

At first glance the design-build concept approach to school building construction appears to have merit. School

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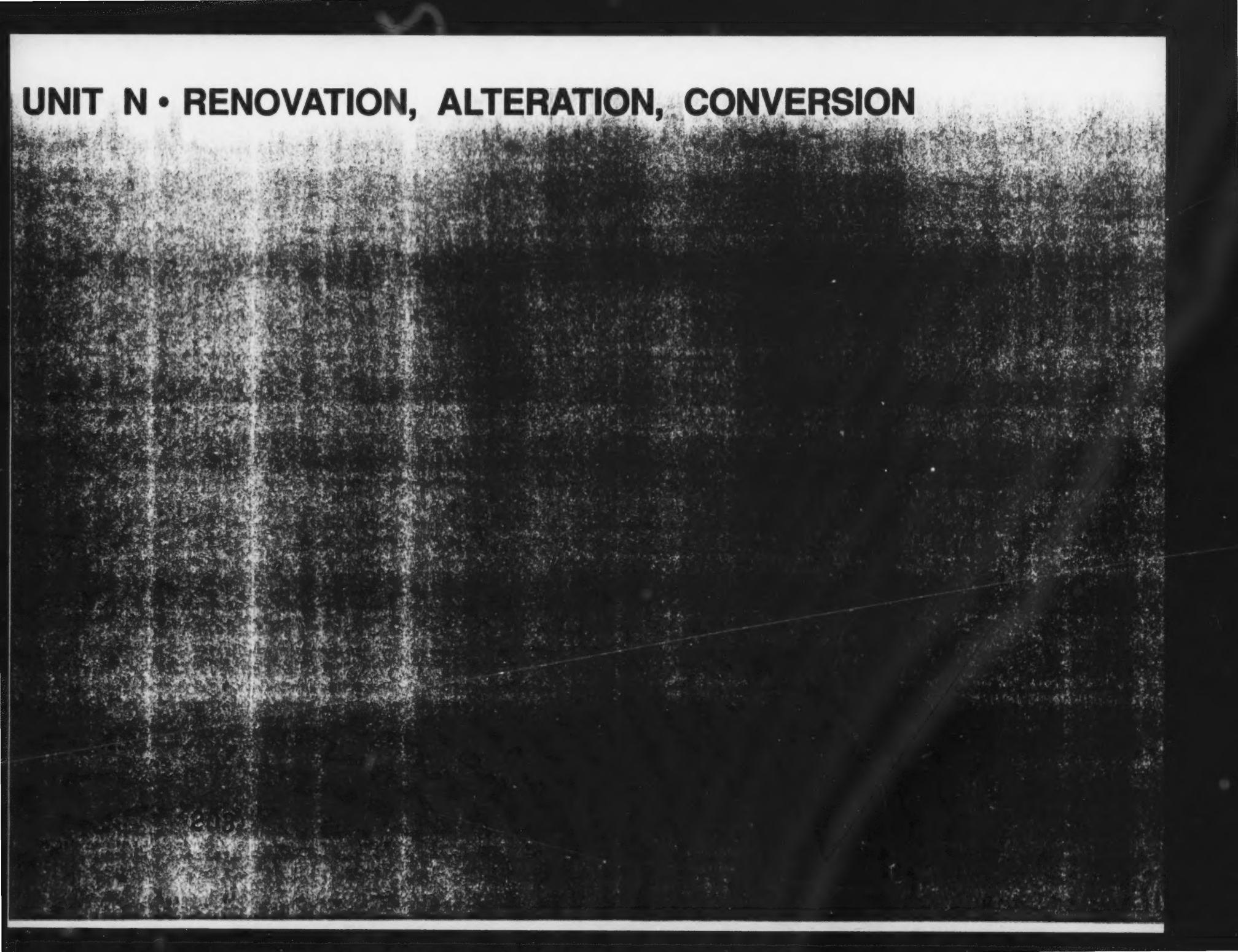
buildings, however, are financed by public monies and must be publicly bid. Most, if not all, states require school districts to award their projects to the lowest responsible bidders as long as those contractors are able to furnish the necessary bonds. In many states multiple prime contracts are also required. Most important, stringent laws in many states require that construction documents (plans and specifications) be prepared by a distinct political subdivision.

These regulations greatly inhibit the use of the design-build concept in public school construction. School districts would be wise to consult the planning divisions of their State Departments of Education before considering the design-build approach.

UNIT N • RENOVATION, ALTERATION, CONVERSION



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RENOVATION
ALTERATION
CONVERSION

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RENOVATION, ALTERATION, CONVERSION

This unit presents criteria that can be used to determine whether to renovate, alter or convert an educational facility. It provides examples of how changes can be accomplished to your advantage, both economically and educationally. It should be noted that the planning principles for new construction outlined in Unit C and Unit M can be applied to the projects discussed in this unit. In all cases, the planning should be related to well-defined educational objectives.

OLD BUILDING/ NEW ENVIRONMENT

The American practice of buying-using-discarding is becoming unacceptable. Advantages of recycling not only newspaper and metal cans, but also larger components of the built environment, including educational buildings, have been clearly demonstrated. Older educational facilities can be excellent resources that should not be wasted. They represent a community's and/or university's identity. Many could be remodeled or altered to serve contemporary educational programs and to provide effective, pleasing environments for learning. An objective of renovation is to keep the best of the past while making the facility meet the needs of the present and future.

The importance of recycling older educational buildings arises from several realities: the high cost of new construction, changes due to high technology, and declining student enrollment. Under these circumstances, it makes sense to examine existing educational buildings to determine their serviceability and adaptability to current needs.

The energy crisis is another condition of our times that has made us look at our present facilities. They may exhibit a partial energy independence through different types of changes. More school facilities every year are becoming exemplary in their use of fuels for heating, ventilating, air conditioning and lighting the environment. All projects involving renovation, alteration or conversion should examine energy needs as a primary objective.

WHAT IS RENOVATION/ ALTERATION/CONVERSION?

Renovation of an educational facility can involve any number of activities ranging from enlivening a drab interior through the use of paint and graphics to making major structural changes by removing walls, creating open spaces or adding new space. It can concentrate on finishes, furniture, equipment, the structure itself, or mechanical, electrical and plumbing systems. The exterior of the educational facility and/ or site could be changed to affect the environment. Renovation allows the educational facility to maintain its primary educational function.

Alteration could involve many of the same activities as renovation but there *could* be a change in the primary function of the educational facility. It could also refer to minor changes made in the facility.

Conversion of an educational facility is a major change in the use of the facility. Many have been converted to usable space for other functions in the community, such as: senior citizen housing, municipal or office buildings, cultural centers, private schools, churches, job corps centers, or community service centers.

DETERMINING FEASIBILITY

Certain preliminary steps must be taken before a renovation, alteration or conversion project is started. The facility and site must be evaluated, which involves selecting assessment tools and establishing an evaluation process. Participatory planning should be considered to bring a greater commitment to the project through the involvement of those who use, build and pay for the facility. The school district or university must be willing to undertake a feasibility study if it is

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to arrive at a satisfactory decision. Any study of existing facilities should include assessments in at least the following areas:

ASSESSMENT

- Program support
- Location
- Structural soundness
- Adaptability of the building
- Adequacy of space
- Aesthetic/historical significance
- Operational and maintenance efficiency
- Conditions of mechanical and electrical systems
- Compliance with safety codes/accessibility
- Site characteristics
- Cost of project

Program support (curriculum planning). The ability of a building to support the educational program or other emergent needs, such as research or extension programs at the college/university level, is the central consideration in deciding whether or not to renovate, alter or convert a facility. Any changes made in the physical environment should enable people to relate to each other, to objects of study, to furniture and equipment and to the space itself in a way will promote the goals of the educational program.

If program support is the basic issue in any change decision, it is also the most complex of the issues to be considered. Conceptualizing new spatial relationships and interior treatments requires imagination, understanding of proposed programs and technical ability. A competent architect is essential for this task. Carefully developed educational specifications are a tool that the architect will find indispensable.

If it becomes apparent that a building cannot be remodeled to effectively support the proposed educational program, there is no need to proceed. Other alternatives should be considered including an alternative program.

Location. School buildings, especially those in urban areas, are sometimes ideally located. They are easily accessible to neighborhood children and public transportation systems. In analyzing the suitability of a school location, the same criteria used in evaluating locations for new construction should be applied. Demographics, current and projected land use patterns, traffic and road conditions should be studied.

Structural soundness. It should be determined if the facility being considered for renovation, alteration or conversion is structurally sound. It must meet local, state, and federal building codes. Severe cracking in walls and floors should be checked. Sagging and moisture penetration are other undesirable conditions. Floor load capacities should be checked against the load requirements of proposed usage. The framework itself should be examined for sturdiness and reinforcement possibilities. The roof should be inspected. Doors, windows, floor coverings, and interior and exterior finishes are other candidates for improvement and replacement.

Usually, a cursory visual examination is not sufficient. The building should be opened up in several places so that conditions will be precisely understood. This practice will prevent the unwise investment of money in a building that has faults which are prohibitively expensive to correct.

If walls are to be removed or any other major structural changes contemplated, then it must be determined that these changes will not weaken the structure.

Adaptability of the building. There is a need today to insure that each educational facility can handle current and future educational programs. These basic questions must be asked: (1) Is the building adaptable; can it handle the proposed change? (2) Can the alteration be made without diminishing the current educational program. (3) Can the building be altered

KEY POINTS TO CONSIDER WHEN RENOVATING

1. What are the educational goals of the educational system?
2. How does this facility/site fit into the overall short/long term plans of the educational system/community?
3. Can the educational facility be renovated?
   a. (structural, mechanical, electrical)
   b. (safety and accessibility codes)
4. What is the historical significance of the area?
5. What is the financial support of the project?

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without compromising its adaptability for additional changes in the future?

Adequacy of space. It should be determined that the space available in the existing facility is adequate for the expected occupancy and planned usage. Enrollment projections should be consulted for information on the numbers and ages of future students.

Aesthetics/historical significance. If a building is historically or architecturally significant or simply an attractive, well-built structure, efforts should be made to preserve and utilize it whenever possible. Interesting or handsome architectural features should be capitalized on in any renovation, alteration or conversion project.

If, on the other hand, the building is ugly or sterile and can be improved only through costly face-lifting and remodeling, serious thought should be given to abandoning it. An important goal of educational facility planning is the creation of attractive environments for learning. The potential for and cost of beauty in an existing school should be a major consideration.

Operational and maintenance efficiency. An attempt should be made to understand what changes must be made in the existing facility to improve the efficiency of operating and maintaining it. For instance, how will operation and maintenance costs be affected by the introduction of carpeting, new wall surfaces, removal of interior doors, installation of new windows, or upgraded insulation? Benefit/cost ratios should be computed for such alterations.

Conditions of mechanical and electrical systems. Mechanical and electrical systems demand thorough analysis; superficial appraisal is risky. Wiring should be inspected and random samples of piping should be removed and inspected. Many older schools are heated by coal-fired, low-pressure steam boilers. In these cases, horizontal return lines may be in poor condition, ventilation may not conform to code requirements, and fuel may be wasted. Replacement of entire systems is normally required. It should be determined whether a new system can be installed without major building changes.

Bringing electrical systems up to code requirements is another critical and costly item. Remodeling should include, but not be limited to, provisions for fire alarms, clocks, telephones, public address systems, television, and numerous electrical outlets for classroom machinery.

Existing lighting systems should be examined for adequacy of lighting levels and efficiency of operation.

Compliance with safety codes/ accessibility. A thorough review and analysis of all applicable building and life-safety codes is imperative. A common provision of building codes requires an entire structure to conform to code if any part of the structure is to be renovated or if it will be contiguous to an addition. Inspections for the possible use of asbestos in school buildings have been required in recent years. Also, Section 504 of the 1973 Rehabilitation Act requires that a facility not present barriers for handicapped persons.

Site characteristics. The adequacy of the site in terms of play and athletic areas, space for environmental studies programs, vehicular access and parking should be studied. Is adjacent land available that would permit expansion? How and at what expense could the original site be upgraded to provide desired improvements? Is the site attractive and usable by the community? Does it have the potential for energy-saving applications, such as solar?

Cost of project. Estimating costs for proposed improvements should involve the use of life-cycle techniques and benefit/cost analysis. Cost figures should be developed and compared

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for all alternatives.

Although a definitive percentage figure would be convenient to use as a guideline in deciding whether to renovate, alter, convert, or replace a school building, such a figure is elusive because of the many subjective considerations involved (for instance, attaching a dollar value to a good site or to a building that has special significance for a community). However, the Research Council of the Great Cities Program for School Improvement and EFL's "New Life for Old Schools" study suggest that when modernization costs approach 50% of the estimated costs of replacement, it is wise to take a second look at the existing building. In actual practice, this figure is generally higher.

IMPLEMENTATION

Once it has been determined that an existing school building should be saved and can be changed, the planning concepts and practices outlined in previous units can be implemented. The same care and sensitivity must be applied to a renovation, alteration or conversion project as to a new facility.

If an educational program is to continue operating during a renovation project, then a well organized plan is essential. A plan clearly indicating each phase of the project and each part of the building affected will help contractors and educators make the best of a temporary situation. The plan must be coordinated with the building administration. Usually the school system will appoint an individual or hire a construction manager to work daily with the architect and contractors. This person would help resolve problems in the best interests of the educational program.

The transformation of an educational facility to a new or different use is an exciting process. An uninspiring, restrictive building can be renovated or altered to accommodate individual study as well as group learning, flexible scheduling, cooperative teaching and the opportunity for improved interpersonal relationships. Spaces may be opened by the removal of partitions. A variety of sizes and shapes can be incorporated. Carpeting, suspended ceilings, adequate lighting, new teaching surfaces, graphics and color can be applied. Courtyards and lightwells may be enclosed. A little used multipurpose area can be converted into a library/media center. Washrooms can be refurbished—new fixtures installed, doors removed and a labyrinth entrance built. New entrance doors are commonly required and justified. Improvement or replacement of windows can be functionally and aesthetically valid. Painting of masonry and painting of trim may be worthwhile improvements. Creative use of a site can provide a learning environment, such as playgrounds and child care areas.

A careful look should be taken at furniture and equipment. It makes little sense to renovate, alter or convert a school building, change the environment, improve the atmosphere and then move the old furniture back in. What worked in the old learning stations may not work in the newly designed learning areas. Some exciting new types of furniture and equipment are available for learning stations; these offer a variety of work surfaces, storage compartments and seating. When equipping new spaces, planners and administrators should be willing to spend money, to be imaginative, and to abandon old patterns and responses.

Renovation, alteration and conversion have become such important parts of the facility picture that good examples are frequently featured in the educational journals. In addition, special exhibits of high quality changes are often a part of exhibits and conventions of CEFPI, AASA ,NSBA, ASBO, AIA, and other professional organizations.

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FACILITIES EVALUATION

A standard evaluation tool should be used in the feasibility assessment process, which is important for consistent criteria.

An evaluation system can be established, with numerous factors listed and a point value determined for each factor. For example, for each factor one of the following point values can be assigned:

5 = excellent
4 = above average
3 = average
2 = below average
1 = inadequate or poor

SCHOOL FACILITIES EVALUATION

School _____

INSTRUCTIONAL ADEQUACY — POINT VALUE		
1. Regular classrooms	____	
2. Special program rooms	____	
3. Laboratories and studios	____	
4. Gymnasiums, cafetorium, multipurpose	____	
5. Media Center	____	
6. Adaptability to future programs	____	
7. Equipment and furnishings	____	
8. Program offering capabilities	____	
Sub-total		____
BUILDING		
1. Size, capacity, and utilization	____	
2. Interior quality and conditions	____	
3. Exterior quality and conditions	____	
4. Energy costs for heating, power and lighting	____	
5. Custodial and other operating costs	____	
6. Handicapped accessibility	____	
Sub-total		____
SITE		
1. Size of the site related to size of building	____	
2. Location	____	
3. Environmental considerations	____	
4. Site development, landscaping, playground	____	
5. Community use of site and building	____	
6. Vehicular traffic patterns and accessibility	____	
Sub-total		____
Grand total		____

Factors can include instructional adequacy, building condition and site adequacy. If twenty factors are used for evaluation, a perfect point score for all factors would be 100. A point score of 90 would indicate a very good school, while a point score of 45 would indicate a poor school.

The "school facilities evaluation" chart shown here can be adapted to the unique needs of the particular school district.

CONVERTING OTHER BUILDINGS TO SCHOOL USE

Warehouses, factories, office buildings, and other noneducational buildings should not be overlooked as potential educational facilities, particularly in urban areas. Examples of successful conversions are many: the University of Colorado at Denver remodeled a traction company headquarters into an urban campus; El Central College in Dallas converted a seven-story department store into an inner-city college; Atlanta converted a former church into an elementary school; Washington, D.C. renovated a supermarket to house a preschool center; and New York City Schools turned the Old World Telegram & Sun Printing Plant into an alternative high school for dropouts.

Converting other buildings to school use today depends on the needs of a community or post-secondary school. In some areas, enrollment decreases have required school districts to find new ways to use excess educational space, not find new spaces. The better use of existing facilities should be a goal of every community.

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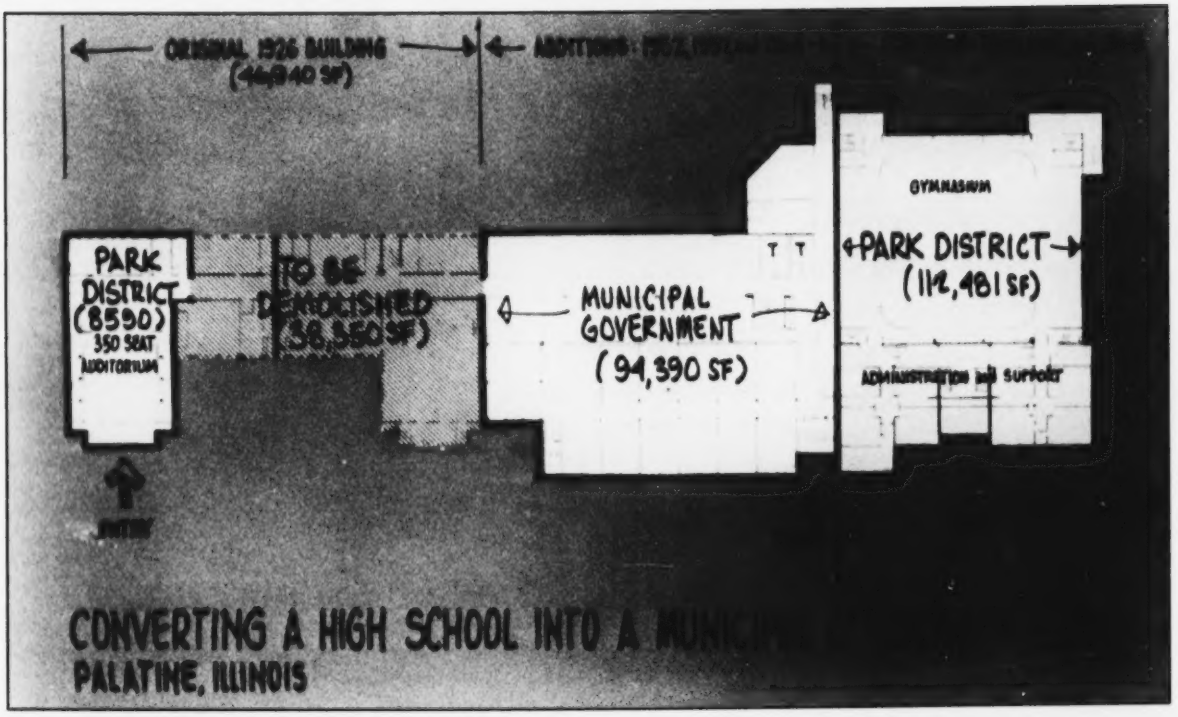
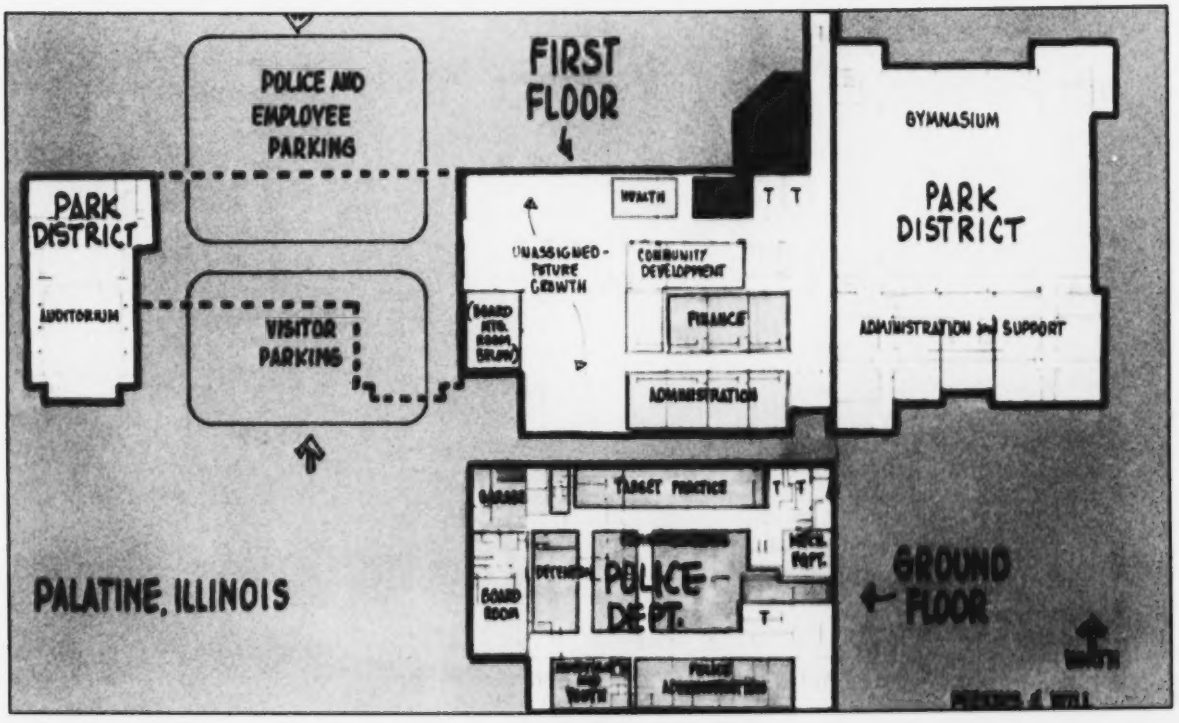

ORIGINAL 1926 BUILDING
(44,940 SF)
GYMNASIUM
PARK DISTRICT
(112,481 SF)
PARK DISTRICT
(8590)
350 SEAT
AUDITORIUM
TO BE
DEMOLISHED
(38,350 SF)
MUNICIPAL
GOVERNMENT
(94,390 SF)
ENTRY
CONVERTING A HIGH SCHOOL INTO A MUNICI
PALATINE, ILLINOIS


POLICE AND
EMPLOYEE
PARKING
FIRST
FLOOR
GYMNASIUM
PARK
DISTRICT
PARK
DISTRICT
AUDITORIUM
VISITOR
PARKING
UNASSIGNED -
FUTURE
GROWTH
COMMUNITY
DEVELOPMENT
FINANCE
ADMINISTRATION
ADMINISTRATION AND SUPPORT
TARGET PRACTICE
POLICE
DEPT.
BOARD
ROOM
GROUND
FLOOR
PALATINE, ILLINOIS

UNIT O • ORIENTATION AND POST-OCCUPANCY EVALUATION

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ORIENTATION AND POST-OCCUPANCY EVALUATION

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ORIENTATION AND POST-OCCUPANCY EVALUATION

As a construction program (Unit M) or a renovation and alteration program (Unit N) reaches its completion, it is time to initiate the last phase of the facilities construction process. The last phase of the well organized educational facility construction process is building activation, orientation and evaluation. To those who are familiar with the systems approach to planning, orientation and evaluation is the step that completes one cycle and provides corrective feedback to the next cycle.

When orientation and evaluation are neglected, the unfortunate result is that the educational administrator, faculty and staff must face the challenges of adjusting to a new facility without professional help to smooth the transition period. The owner who helped to select the carpet may be faced with difficulties in trying to clean it. The owner who requested flexibility may be stuck with demountable partitions that he doesn't know how to rearrange. The owner who wanted innovative design solutions may be immersed in conflict because established use patterns are impeded by a new building configuration. The owner who wanted to develop a computer lab may discover that the electrical services or room climate are not as expected. The owner who insisted on rooftop heating and cooling units may discover that district maintenance personnel cannot maintain them. In this manner, the potential of many advantageous design features may never be realized because the users do not understand the purpose and ideal operation of the building. Consequently, a demountable partition that will not be moved is as inflexible as a masonry wall.

An educational facility must be congruent with ideas that are understood and supported by the users. A new environment alone will not impel change in behaviors that have developed through time and experience with other environments. If, of course, the users were involved in the initial planning stages and the design of the facility reflects their preferences and intended usage, the problem is more than half resolved. If not, simple orientation must become something more comprehensive, perhaps more like in-service training.

The orientation and evaluation phase may be completed in three stages. The first stage includes building activation—the process by which the building is placed into operation. The next stage involves orientation of those who will live in and use the building: the building operators, the prime users (teachers and students) and the public. The last stage is the post-occupancy evaluation, which includes both a technical evaluation of the performance of all subsystems as well as a functional evaluation of the extent to which the facility meets and serves the program objectives.

BUILDING ACTIVATION

Building activation is the process of advancing a school building project from the static state of completion into an activated and integrated facility that functions in accordance with the design intent, the specifications and drawings, and the overall functional requirements.

During this process, individual pieces of equipment or components, as well as systems of components, are tested to make sure that they are in good working condition. More importantly, various systems of the building complex such as the architectural, structural, mechanical and electrical systems are checked to assure that they function together properly and adequately as a fully integrated facility. Records of correct performance and deficiencies resulting from this process are proof of the facility acceptability as well as a reliable data base for further evaluation.

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ORIENTATION PROGRAMS

A teacher's involvement with a facility differs from that of a chief of maintenance or a community resident. Consequently, a variety of orientation programs should be developed. Two main categories are user orientation programs and public information programs. The first is directed at the needs of the persons who will work in the facility. The second is intended to promote familiarity with the school as a community resource.

One orientation tool that is meeting with growing acceptance is the user's system manual. It includes three basic types of information: (1) a summary of the project's history and the most influential design concepts, (2) an explanation of how these concepts are implemented in the actual design and major use guidelines, and (3) a maintenance and operations section giving technical data on the building systems and components, cleaning instructions, guarantees, and other vital information.

The manual should be informative rather than restrictive, telling users what was intended and allowing them to use the building as effectively as possible and in accordance with their needs. The user's manual provides a record of design decisions. It is a resource book of utilization and maintenance information to which users might not otherwise have access when the original facility planners are unavailable.

Detailed orientation sessions directed specifically at answering questions of school administrators, faculty and staff can take the form of a building tour conducted by the design team, made up of the architect, consultants and district personnel. Project background, design concepts and intended use can be explained.

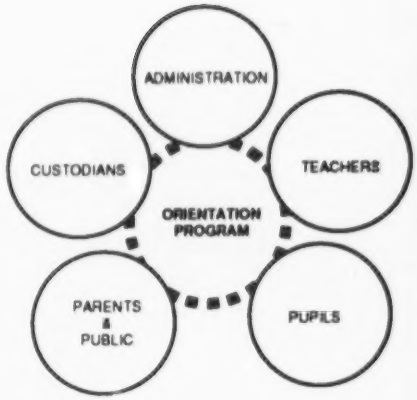
In-service programs for teachers concentrate on the relationship between the facility and the educational program and the ways the building can be used to realize program goals. These orientation programs are particularly valuable when innovative educational programs are implemented. Programs should cover staff use of the entire building, including questions such as why windows should not be open when the air-conditioning is turned on.

Building and equipment review sessions allow the architect, consultants and manufacturers' representatives to demonstrate and discuss the operation and maintenance of various systems, equipment and interior elements. Review sessions help to prevent operation and maintenance problems resulting from unfamiliarity with sophisticated equipment. While the audience here is largely administrative, maintenance and custodial staff and others should not be excluded if the building operations will be part of their responsibility.

Selection of the maintenance engineer well in advance of occupancy allows this person to study the mechanical systems that are being installed. This helps the engineer gain experience with the facility and its mechanical systems and makes misuse less likely.

Public information programs are normally less detailed than are user orientations. They are designed to promote familiarity with the educational facility rather than in-depth understanding of how the facility can be used. Such programs are important for two reasons: they provide an awareness of how the tax dollar is being spent and they provide an understanding, particularly important for parents, of some aspects of the educational environment in which their children will learn. In community school situations, public information programs are of interest to a larger number of citizens because of the broader implications of programs and facilities.

The following activities will inform people about the purpose of the school and its unique design features:



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- Media features (newspapers articles, radio or television programs) that discuss and illustrate the new educational facility.

- Brochures with maps, photographs and text that briefly explain the design and educational concept.

- Open house or tours conducted by students who have been briefed about the building and its relation to the educational program.

- Printed material for distribution to visitors interpreting the new facility and program. The best of these handouts include photographs, cost information, design history, and explanations of special features and equipment. A building plan and a succinct explanation of various educational programs can be included. Documentation of planning considerations related to building and site are also important.

POST-OCCUPANCY EVALUATION

Once the building is completed, the occupants and community have been oriented, and the program is implemented, it is time to look at the results of the planning, design and construction efforts. Post-occupancy evaluation is easily ignored. When the project appears finished and other matters are pressing, appraisal is normally not an urgent priority. However, the work of the administrator, the architect and other planners is not finished at this stage.

Although post-occupancy evaluation lacks definitive methodology, it is an important activity and an essential part of the total planning process. It is often referred to as the last stage of the planning process, but it is not. The evaluation of an educational facility is a continuous activity. In recent years, it has become common practice to evaluate a facility during the first year and then at intervals through the next three to five years.

ELEMENTS OF A POST-OCCUPANCY EVALUATION

TECHNICAL ELEMENTS
- Site
- Engineered Systems
- Architectural Features
  - Interior
  - Exterior

FUNCTIONAL ELEMENTS
- Community Context
- Building Site and Grounds
- Facility Spaces
  - Design Features
  - Environmental Quality
  - Services

OPERATIONAL ELEMENTS
- Safety
- Operating Costs
- Maintenance Costs

The evaluation provides an opportunity to obtain information that can be used to improve the planning and construction of future educational facilities. (Note the similarity between the types of information collected in the post-occupancy evaluation and the types of information used in development of a comprehensive facilities master plan — Unit C). A school building's effectiveness is measured by how well the facility provides for the many and diversified teaching and learning activities that take place within it. The information obtained through a post-occupancy evaluation can provide valuable information to:

- Determine how successful the planning of the school building has been.

- Determine how well the building responds to the educational specifications and the on-going educational program.

- Identify changes in the planning process that might be required and a plan to implement them.

- Identify particular features of the building that should or should not be repeated in future projects.

- Determine the success of the design and construction elements.

- Identify and plan corrective measures for the school being evaluated.

Many people can participate in the evaluation. The responses of the users of an educational facility are most important. This could include teachers, administrators, students, aides, and custodial, secretarial and food service personnel. Additional participants could include the project architect, the district's facility planner, central office personnel, community members, and regional, state or federal officials. The experiences, perceptions and expectations of each evaluator are different; their input is vital to give a total and balanced evaluation of the facility.

From the input of these participants, an evaluation of an educational facility can include a systematic compilation of quantifiable information, such as student/teacher ratios, square feet per classroom or learning area, costs per square foot, costs per student, square feet per student, life-cycle economy and construction time. This information can serve as a form of spatial inventory for the school district.

Evaluation permits a school district to assess various architectural and educational innovations, for instance, flexible, open-plan schools may be compared to schools with enclosed classrooms or with other configurations. When the evaluation is used to collect information for comparing costs, number of change orders, building schedules, and the like, the school district can form a basis for projecting costs and schedules for future construction projects. Evaluations can be used to assess the architect and to ensure that the school district specified what it needed, got what it specified, and needed what it specified. The architect, in turn, can determine if what the client said he or she wanted is actually being put to use.

WHO DOES THE ORIENTATION AND EVALUATION?

Orientation and evaluation is the responsibility of the architect and the facility planner or educational administrator most closely related to the project. The architect's responsibilities diminish stage-by-stage while the educational administrator's role increases.

The architect's prime responsibility lies in the building activation stage and in the orientation of administrators and users. The educational administrator is involved in the building activation but assumes more responsibility as the stages progress toward the final step, the post-occupancy evaluation.

HOW IS IT DONE?

The first stage — the building activation — follows generally accepted patterns. Deliverables include not only a building that has been checked out completely, but a system manual describing how the building is to operate and a set of maintenance and operating manuals for all subsystems.

Less rigorous procedures are followed in the orientation stages. The objective is to thoroughly familiarize all users with the building and its operating characteristics.

The post-occupancy evaluation is best handled by the use of a suitable questionnaire or evaluation instrument. There are many types and styles of evaluative instruments and procedures available. Educational administrators can review and select an evaluation instrument from a variety of sources. Some are available commercially or from colleges and universities. Others can be obtained through national or regional evaluation or accreditation programs, or from state education agencies. Although they may vary in scoring method and format, they all seek to qualify the judgement of the evaluators and to present a report of the results.

Evaluations that are too complicated, too time consuming, or too expensive to be done regularly are not effective. An important criterion in selecting an evaluation instrument is practicality. A small-scale evaluation that is done regularly is more valuable than a prohibitively complex one. It should be recognized that the evaluator is more important than the evaluation tool; the use that is made of evaluation results is even more critical.

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POST-OCCUPANCY EVALUATION DESIGN STRUCTURE

EVALUATION FOCUS
- Identify the purpose for the evaluation, i.e., what decisions are to be served eg., establishing repair and maintenance schedules through identification of needs, informing capital funding approval and allocation decisions, and design feedback for future facilities.
- Identify components and factors required to be evaluated.
- Establish evaluation standards, criteria and measurements, for both the technical and educational aspects, eg., adequacy and suitability for educational program and instructional practices, degree of deterioration, health and safety, design weaknesses and deficiencies.

DATA COLLECTION
- Identify
  - Data Sources
  - Collection instruments and procedures
  - Sampling and testing procedures

DATA ORGANIZATION
- Identify format for data collection, recording, storage and retrieval

DATA ANALYSIS
- Identify analytical procedures and outcomes

INFORMATION REPORTING
- Identify reporting format and schedule

ADMINISTRATION
- Define evaluation personnel and budget requirements
- Define evaluation policies, procedures and schedule
- Specify schedule and means for updating evaluation design

It should be evident that the planning process, at this point, has come full circle. The process that began with an assessment of needs and an evaluation of existing facilities (see Unit C), again resumes with the appraisal of existing facilities. If the purposes and process described in this unit are followed, the building project should come to a successful conclusion. Subsequent projects are likely to be more successful as a result also.

UNIT P • COLLEGE AND UNIVERSITY PLANNING

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COLLEGE AND UNIVERSITY PLANNING

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COLLEGE AND UNIVERSITY PLANNING

Institutions of higher education (including two-year junior or community colleges, four-year senior colleges, and universities) present the facility planner a challenge beyond the scope of traditional elementary and secondary schools. Among those characteristics unique to higher education are: varied curricula, extensive support services, student activities, housing, parking, full-line food service, health services, and others. The coordination of these factors to achieve the desired environment requires thorough planning, involving students, faculty, staff, and alumni.
Planners will encounter a variety of curricula in higher education, ranging from secondary school remedial to postdoctoral studies. These upper level educational programs significantly affect space planning needs. Nursing education is an example. This specialized instructional area, which includes health care and patient services, requires coordinated laboratory and classroom space with sophisticated media capability. The same is true of programs in agriculture extension services, mass media, museums and galleries, research, and sports.

The scope and extent of supporting services add another dimension to physical planning for higher education. Among these are library and learning resources, administration, plant operation and maintenance, health services, student records, and student and faculty housing. In addition, facilities are often provided for personal services, including dry cleaning and laundry, post office, banking, and personal grooming. Colleges and universities also operate auxiliary service enterprises such as printing, transportation, food warehousing and processing, carpentry, electrical, upholstery, refrigeration, and lawn care. Co-curricular and extracurricular student activities are varied and extensive in higher education. Two main factors, a diverse population and a large amount of on-campus discretionary time, intensify the need for planning adequate facilities for students. Most universities provide a student center or union to house a variety of activities. Spaces for meeting, lounging, studying, games, arts and crafts, and similar activities must be considered in the planning process. More recent innovations affecting planning are the recreational complexes to serve an entire campus and small centers serving clusters of dormitories. These complexes are specifically designed for student use of leisure time. They must be planned to accommodate a variety of individual and team games and exercises, often times on a twenty-four-hour schedule.

Other factors unique to higher education have an impact on physical planning. Enrollment, for example, is voluntary and subject to shifts in social and economic trends. As a result, projections of student count are difficult. Facility planning is also affected by program choice after enrollment and by the proportion of full-time and part-time students and commuting students. These factors affect food services, and lounge and study areas. The context of higher education presents unique variables for the facility planner. In many ways, college and university campuses are like cities. Planning facilities and related areas to meet the complex needs of higher education presents the professional planner with many opportunities for creative solutions.

Educational facility planning for higher education is normally termed campus planning. Campus planning deals with a series of buildings, including landscaping, zoning requirements, access, parking, utility systems, security, and auto, pedestrian, and two wheel vehicular traffic. In addition, recent pressures of declining enrollment and shrinking financial resources have forced institutions to pay increased attention to energy conservation and life-cycle costing. These elements must interrelate to create an entity known as the campus. The objective

of campus planning is to produce a smooth interrelationship among these elements to create a functional, efficient unit that is environmentally and aesthetically appealing. To accomplish this, the campus planner must use the methodology of the professional educational facility planner, with assistance from the urban planner, structural and landscape architects, designers, civil engineers, graphic artists, and specialists in capital financing and budgeting. Campus planning has become an accepted and important function on campuses around the world.

TYPICAL CONCERNS

Land use and zoning. The land and its capacity for development represent the first and most important determinant of the overall campus plan. The quality of land available affects many aspects of the campus plan, including (1) the intensity of building development, (2) the type of parking system to be employed, (3) the circulation pattern, (4) the availability of resources to support areas such as housing, (5) research and other non-teaching functions of the university, (6) the kind of programs that can be offered, and (7) the enrollment.

Land use represents the primary development guidelines on which all other elements of the campus plan are built. Campus land uses are normally divided according to the principal academic and support activities that characterize the campus itself. Major land use categories encountered in a typical campus plan include: (1) building sites, (2) teaching and research, (3) recreation fields and courts, (4) intercollegiate athletics, (5) parking ramps and lots, (6) agricultural production, (7) streets and roads, (8) airport, (9) campus areas, and (10) investment property.

There are many ways in which these individual land use elements can be organized in developing the plan for an individual campus. The choice of patterns will be influenced by the historic development pattern of the campus, the academic mission and role of the institution, the academic plan itself, and the time-distance relationships between key facilities on the campus. These concerns must be examined on an individual basis with particular regard to the unique characteristics of each college or university.

Campus access. Access has become an increasingly important element in the planning of the campus. Even the traditional older schools have become more oriented to the movement of people to and from the campus, and many new institutions, particularly the community colleges, have become commuter schools dependent almost entirely upon access by automobiles.

The campus circulation system must be properly coordinated with the overall transportation system serving both the community and the region. The failure to achieve a proper integration not only will hurt the functioning of the campus, but also can lead to conflicts that will be a source of continued aggravation dividing the campus from its host community. The question of access to the campus cannot be dealt with by the university in isolation. Cooperative planning among the university, its host community, and the regional or state transportation agencies is absolutely essential if a well integrated, smoothly functioning access system to the campus is to evolve.

Circulation systems. Circulation on and around the campus must be considered. In campus planning, circulation includes movement of vehicles, pedestrians, bicycles, and service equipment.

In planning vehicular circulation, the ideal situation typically is to create: (1) a ring loop in which traffic will move about the periphery of the campus; (2) a series of penetrators to allow traffic to move from the ring road to destinations on campus; and (3) a series of minor campus streets to allow for servicing and maintenance

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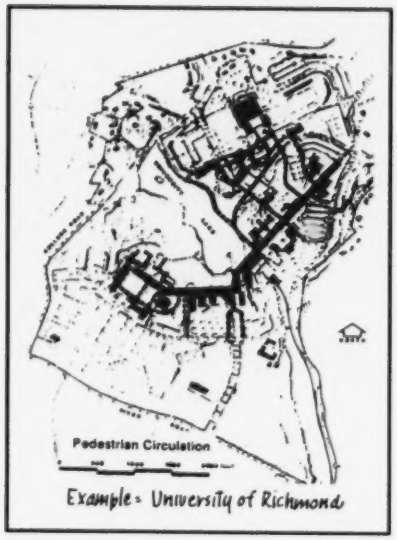

of facilities. In many cases the ideal situation is not in place, and planners must work to adapt the existing system to approximate the ideal. It is often necessary for the planner to work cooperatively with municipal authorities in order to implement an effective vehicular circulation plan.

Circulation planning is a discipline of its own in the field of traffic engineering. Detailed issues such as roadway design, operations, signals and intersection design should be handled by professional traffic engineers. The input of these experts in the production of the overall campus plan is important if a truly workable system is to be developed.

The pedestrian circulation system is one of the principal exterior design elements that tie the campus together. It has constant and significant impact on users and visitors to the campus. Careful planning and design of pedestrian patterns should be a major consideration in campus planning.

A pedestrian circulation system normally includes:

1. Major plazas or squares (gathering points and transition areas between buildings and other elements of the walkway system)

2. Major pathways (carrying the heaviest volume) of pedestrian traffic

3. Major intersections of pathways

4. Minor pathways

The issues of layout, walk materials, width and placement, scoring patterns, and maintenance must all be considered in designing appropriate walkway systems.

Bicycles have long been a major means of transportation on university campuses and in university communities. With the growing cost of energy, their popularity among students and faculty is increasing. Proper accommodation of the needs of bicyclists should be addressed in the campus plan. Where buildings are well spaced and there is a relatively generous amount of land area on the campus a separate bicycle path system may be established. This has been done at the University of Illinois and at Michigan State University. In some cities, such as San Francisco, a separate bike network has been established on the city street system that allows movement to and from the campus by means of already established streets. In other cases, the pedestrian walkway is combined with bicycle circulation. Any of these systems can work effectively if properly planned and designed.

Bicycle storage and security are also important considerations. A wide variety of bicycle racks are on the market today, and each campus must evaluate the various systems to determine which is most appropriate for the campus.

Access for service equipment must be provided to every building or group of buildings on the campus so that goods may be delivered and waste material removed as part of the day-to-day operation of the university. This can be done using the normal roadway circulation system, special access service drives, or a portion of the walkway system. All of these solutions have been employed in various places and have been made to work effectively. Each campus, however, must study its own needs and operating characteristics before determining which solution might be best.

Parking. No other area of concern in campus planning causes so many problems and so much controversy as does parking. Planning for adequate parking, like circulation planning, must rely heavily on the expertise of people from the field of traffic engineering and parking management.
The basic methodology to be followed in determining the parking program for the campus can be outlined as follows:

1. Estimate the demand for parking space.

2. Determine the space required to accommodate the demand.

3. Decide management issues, such as priorities for student, faculty, staff and visitor parking.

4. Develop a plan.

Most parking programs turn out to be a combination of corrective measures to deal with existing problems on the campus and the addition of new spaces generated by such developments as increases in the campus population and changes in parking standards. Although some campuses do an excellent job of accommodating parking demands, the parking problem is typically one that is never totally solved. The best an institution can do is to shape a rational and well-conceived program that meets parking demands as established by the best data available at the time.

Utility systems. An essential, yet often neglected, element in the planning of any campus is the utility system. The major utility systems include heating and air conditioning, electricity, gas, water, sanitary sewage, storm water or drainage, phone and telecommunications, and trash removal. While it is not necessary for the campus plan to do detailed engineering of the various systems, it is important to assure that a proper network of distribution lines is provided for in the planning and that the network does not impede the development of major campus buildings or other surface features. It is also essential to assure that the capacities of the various systems and the demand of the campus for service remain in balance.

In this era of energy consciousness, many campuses are investigating the use of environmental controls, which can regulate the consumption of heat and conditioned air in buildings from a central source in response to the actual needs of the building. These computerized controls can be applied not only to the air conditioning and heating system, but also to other systems such as electricity and building ventilation.

The coordinated development of the utility system, the circulation system and major building elements affords the opportunity for achieving real economy in the development of the campus and, therefore, should become an essential part of any well-conceived campus planning program.

Ecology. Ecology is the study of interrelationships between organisms and their environment. Applied to campus planning, it is the investigation and application of sound principles to the interrelationship between built systems and natural systems to ensure a campus in harmony with nature, yet able to meet the needs of human users.

The following must be considered: landscape quality, the links between development and vegetation removal, run-off and waste disposal, noise containment, and the provision of useful spaces for people. The question becomes one of preservation, modification, and change.

Aesthetics. A major concern in campus planning is the maintenance of an environment that has aesthetic appeal throughout. Some of the questions to be raised are:

1. Is the campus organized on the basis of quadrangles, major axes, or other geometric forms that will affect planning decisions?

2. To what limits can buildings rise or spread without adversely affecting the form and function of the campus?

3. How does the campus join surrounding areas?

4. What are the implications for the aesthetic quality of existing or

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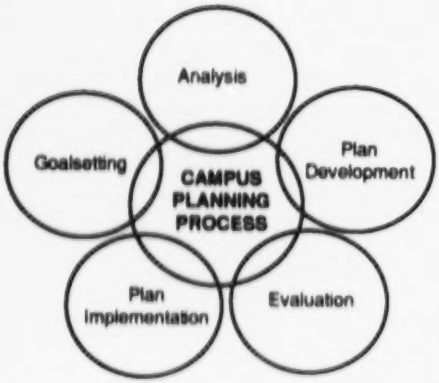

proposed pedestrian and vehicular corridors?

5. Do the furniture and equipment in buildings form an element of continuity across the campus?

6. How can sculpture, fountains, and other art inclusions be introduced to create special aesthetic appeals?

7. What plant and other landscaping materials can be used to promote unity and the aesthetic quality of the campus?

Planners must deal with these concerns in the context of each individual campus. The appropriate solution to these problems is of prime importance if the campus is to embody a high quality of aesthetic appeal.

Building code regulations and other requirements. The university must function within the framework of a variety of governmental regulations and limitations affecting the physical development of the campus. At the local level, these can include zoning ordinances, building codes, demolition requirements, soil sedimentation ordinances, and landscaping requirements. State level limitations might include fire protection codes, handicapped codes, and life protection codes, while the federal government might enforce lab spacing requirements, hospital certificate of need requirements, and occupational health and safety standards. Outside government, other requirements may be imposed by the tradition of the institution, donors, or other external agencies. These elements are important factors that must be taken into consideration if the plan is to be a realistic and effective means of shaping the future growth of the campus.

PROCESS AND PEOPLE

A successful campus planning program requires two basic components, namely, people, and a well-defined planning process. In a dynamic institution with constantly changing programs, a continuous planning mechanism must be in place and working. Conversely, if any planning system is to be effective, it must have the expertise and general support of the entire campus community. Failure to recognize this interrelationship will seriously jeopardize the quality of education provided to students. A finely tuned system for planning provides the best today and flexibility to continually adapt to certain change.

Process. Campus planning can be viewed as a five-step process that includes: (1) analysis, (2) goalsetting, (3) plan development, (4) plan implementation, and (5) evaluation.

A careful inventory and analysis of existing conditions on the campus is the starting point for future development. Among the variables to be considered are: (1) environmental features, such as topography, soil, hydrology, vegetation, and land forms; (2) the number, functionality, and condition of existing facilities; (3) land use, circulation systems, parking, utilities, lighting, and signage; and (4) regulatory factors, including regional and local master plans, zoning, historical districts or buildings, and alumni priorities. This kind of information provides the base from which to examine future development.

Institutional goals must be specific and measurable if they are to be statements around which campus planning can be built. Academic goals should include programs, enrollment projections, faculty teaching responsibilities and conditions of service, and support programs. Goals to provide for the nonacademic needs of the campus should be developed in the context of supporting the institution's prime responsibility — teaching and learning.

The plan development phase sets forth recommendations considered in terms of the proposed goals of the institution. Programs and enrollments will determine building requirements in

terms of square footage and student stations. This will in turn define the location and number of parking spaces, road locations and load capacities, pedestrian circulation, and service requirements. Plan development also will consider the aesthetic and ecological environments and the realities of financial resources.

The plan document should be complete and should include lucid descriptions; drawings when necessary, to explain and illustrate; and a narrative giving the rationale underlying major decisions. The document should be viewed as a proposed guideline and as an instrument for public relations.

A realistic process for implementing the campus plan should (1) provide for phased development, (2) strive to achieve a finished look to the campus at all phases of development, and (3) provide consideration of the displacement of people and programs in renovation projects and the consequence of construction on the daily life of the campus. Coordination and communication are essential elements at this stage of the process.

The evaluation phase allows planners to determine whether the program is carrying out the guidelines set forth by the master plan and whether the process is meeting the goals and objectives set forth in phase two of the planning program. Evaluating the planning process will involve considerable interaction with others, including administrators, faculty, students, the community, and alumni. Responses can be used to modify or refine the process and provide a base for future planning and development.

People. Successful planning for higher education requires the involvement of people. An easy way to meet this responsibility has not been found. The person responsible for coordination must become a student of participatory planning if the institution is to achieve quality. There is no substitute. The college or university professional planning staff has the responsibility for coordination and for production of the planning document. Assisting are the institutional planning committee and special consultants.

The in-house staff can range from one campus planner to as many as fifty or sixty people at a major university. The size of the staff is not important. Results based on a consistent planning process and ideas generated by people working together are critical elements. The in-house staff usually undertakes the following duties:

1. Intelligence function (measuring and evaluating existing activities and physical plants; predicting the effects of physical changes on curricula, institutional goals, and enrollments)

2. Community relations function (those studies, communications, meetings, and measures necessary to coordinate institutional and community growth objectives)

3. Programming function (identifying development problems, posing alternative solutions, preparing documents to ensure that project designs will reflect long-range development policy)

4. Physical plant development (preparing capital improvement budgets and preliminary and final project plans, supervising construction)

5. Secretarial function (keeping all records, documents, and other materials necessary to carry out planning, programming, and physical plant development)

Institutional planning committee. The institutional planning committee is a common channel for input into the planning process. It should include executive officers, academic deans or department heads, maintenance and operations personnel, faculty, student officers, and alumni. The size of the

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group should lend itself to operational efficiency. An open channel of communication to the chief officer of the institution is imperative.

The role of the institutional planning committee is to review, propose, and advise. Specific activities are to review existing conditions, to assess and verify needs, and to establish priorities for the quantity and quality of facilities and related service. The group advises the administration of its priorities and works to communicate with the larger campus community.

Consultants. Consultants are a major source of assistance in developing and implementing a campus plan. The consultants may be campus planning specialists, architects, designers, or traffic, parking, civil, mechanical and electrical engineers.

SUMMARY

Educational facility planning for higher education is normally termed campus planning. Typical concerns of the campus planner are land use and zoning, access, circulation systems, parking, utility systems, ecology, aesthetics, building codes, and the requirements of tradition. The planner must coordinate these components to achieve a functional and efficient unit that is both environmentally and aesthetically pleasing.

Campus planners will encounter variables unique to higher education. Among these are the variety of curricula, extensive support services, co-curricular and extracurricular programs, fluctuating enrollments, and varying proportions of full-time and part-time students. The context of higher education is not unlike city planning. Planning facilities and related areas to meet the complex needs of higher education presents the professional planner with many opportunities for creative solutions.

A successful campus planning program requires two basic components, namely, people and a well-defined planning process. The process includes analysis and goal setting, plan development and implementation, and evaluation. Cooperating in the production of the campus plan are the in-house institutional planning staff, the institutional planning committee, and special consultants. The product is a plan to provide maximum facilities and services to enhance the learning process.

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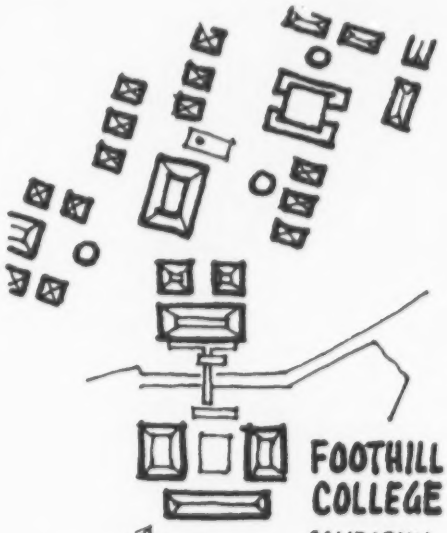
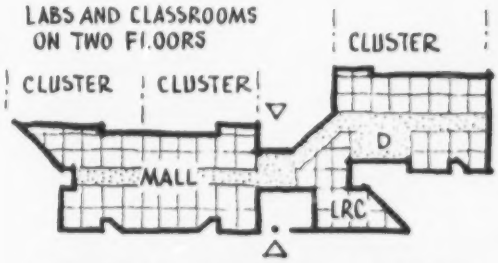
COMMUNITY/JUNIOR COLLEGE PLANNING



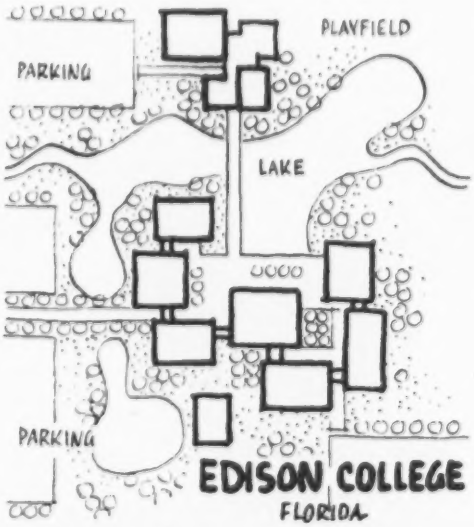
FOOTHILL COLLEGE
CALIFORNIA

Separate buildings – where climate encourages outdoor circulation.



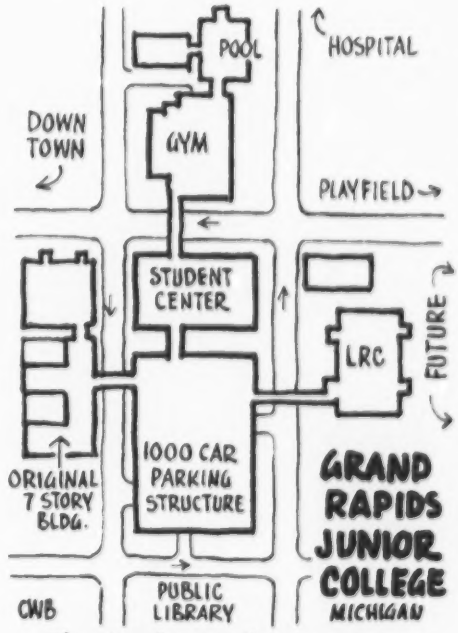
OAKTON COMMUNITY COLLEGE
ILLINOIS

All facilities in a single building along a student mall.



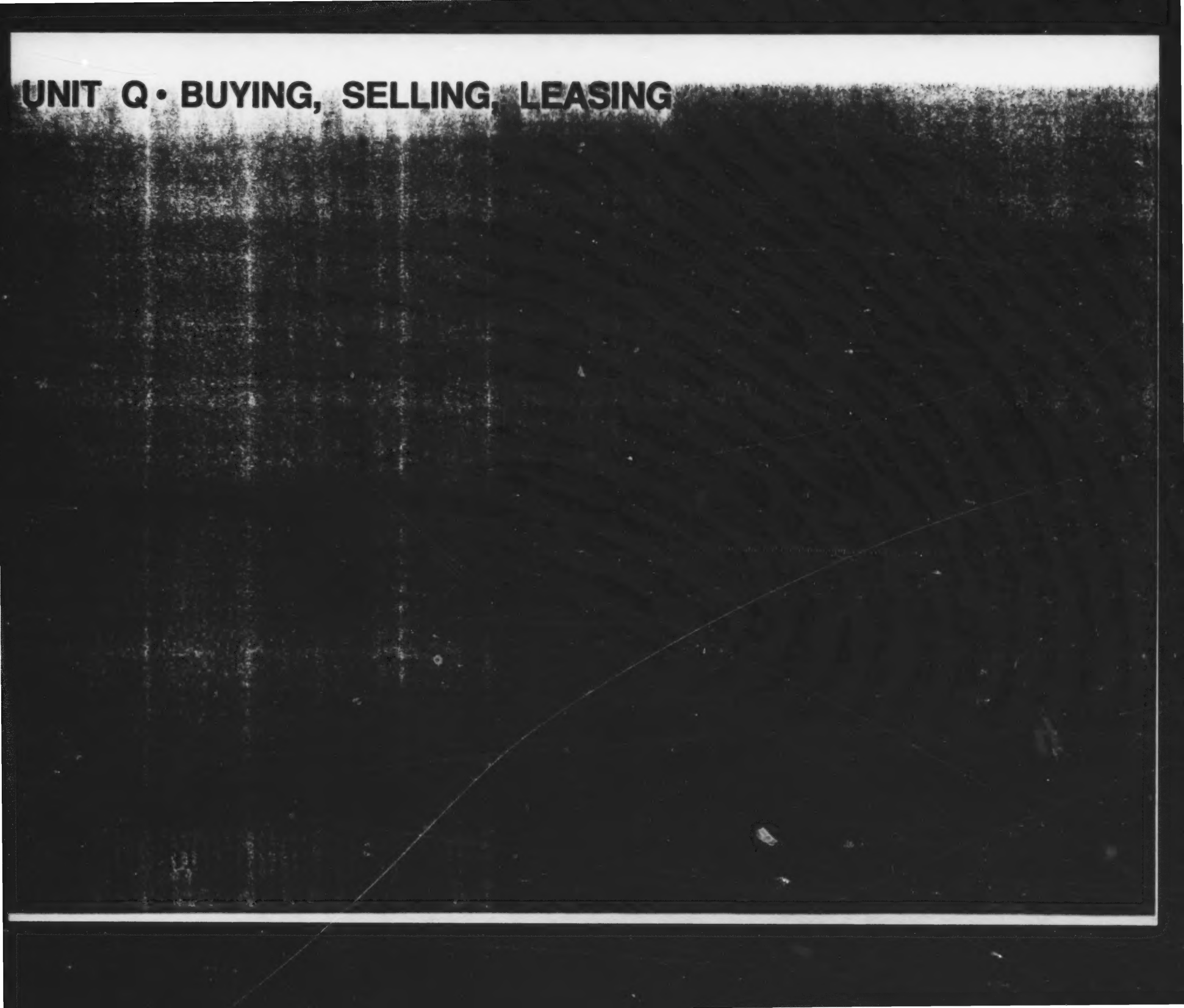
EDISON COLLEGE
FLORIDA

Linked buildings ... for convenience ... but allowing for incremental growth.



The downtown college campus ... allowing for growth in stages ... with pedestrian bridges over city streets.

UNIT Q • BUYING, SELLING, LEASING



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BUYING
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BUYING, SELLING , LEASING

This unit deals with the management of capital resources through buying, selling and leasing educational facilities. The procedures presented here deviate from the traditional method of acquiring a building by a governing board or a college/university (i.e., hiring an architect to design a building, submitting it to the bid process, and constructing it).

Buying, selling or leasing property for school use can be complicated. Building codes and legal, funding and public relations issues must be considered. Long-range planning, community involvement, open communications, a little vision and a lot of common sense can make these options a successful use of educational capital.

BUYING

Rationale. The outright purchase of a building by a board of education or board of trustees for use as an educational facility is not a frequent occurrence compared to the usual process of constructing facilities. However, it is one option that should not be overlooked.

There are compelling reasons for a board to acquire a building through purchase. It might be, for example, that a facility is needed immediately and an appropriate non-school facility is available. Opening a school is good utilization of a surplus facility, particularly if it is surplus to another branch of government. Given the same immediate need, a board might get faster results by commissioning a private firm to construct a building to be purchased by the board upon its completion. However, comparative studies indicate that a purchased building may be considerably less expensive than one acquired through the traditional process. Whatever the reasons for the purchase of a building by a board of education, the building must, by the time of occupancy, meet the building codes in force in a given province, state or local community.

The Seller. There are several persons, firms and agencies who will sell a building to an educational governing board.

Units of government at local, state, provincial and federal levels can sell buildings to each other. This has been especially true when a building becomes surplus to a particular governmental function. It is not uncommon for a municipal government to sell its companion board of education a facility when it can be renovated to code compliance. The state and federal governments can do the same if the code conditions are met.

Private developers can sell facilities to a school district, college or university. They can be commissioned by a board, or can "market" a building that is already in their inventory or that they would be willing to build to specifications. As with other purchased buildings, codes must be met. A special type of private developer is the design-build firm that can provide a building to a governing board, with limited input. A design-build firm may include architects, engineers and construction contractors as its principals.

A bonding authority, with legal status, can also sell a building to a governing board. Such an authority is usually created only to provide school facilities. It is described in more detail later in this unit.

Funding. The legal provisions for acquiring sufficient funds to purchase a building are varied, as is the case with many laws concerning facilities. However, there are general aspects to funding such a purchase.

The sources of funds do not differ significantly from traditional sources. Bonds can be sold for the purchase of a facility. The constraint in many instances is statutory in that bond sales are only allowable for facilities provided through the traditional procedures. Debt for a purchased facility also can be paid off from annual allo-

cations in a district's current expense budget. The constraint here is that, in states and provinces where building aid is paid to local boards of education, the aid is sometimes lost because the budgeting amount is in current expense accounts and not in debt service or debt principal accounts. It is a matter of fiscal strategy similar to that discussed in the section on leasing. Although it occurs in rare instances, a district also can purchase a facility with accumulated budget surpluses.

Joint occupancy. Joint occupancy is the cooperative use of a facility by multiple public agencies or by public and private agencies together. It offers another way for a school district to buy a facility and provides a sound fiscal argument for doing so. Although joint purchase of a building is rare, some large urban districts have entered into an agreement for joint purchase and occupancy. Pre-planning ensured both agencies that their activities were compatible. Two such compatible mixes are school and office use, or school use and housing.

Often a private owner has contracted for the construction of an entire building and has sold the district its portion. This arrangement has potential for savings. In other instances, the contract has been a cooperative purchase venture and resulted in savings. The costs of certain portions of the building were shared because their use was shared, such as parking, recreational facilities and performing arts areas.

An even more financially beneficial arrangement results when a district owns the site, especially if the site is in a prime location and/or has a high per-acre cost. The district can lower its construction costs by allowing the private agency/company to construct a building for joint occupancy on the site. This has also occurred in urban districts. However, some smaller, suburban districts have had schools constructed at no cost to them by providing the site on which the private company builds a school as well as its own facilities.

Joint purchase of a building for the purpose of joint occupancy is not common because of legal constraints. Building codes for schools are often more stringent than for other types of buildings. Consequently, school buildings often cannot be part of a jointly-occupied building. Another problem is that tougher codes create higher construction costs, which could restrict the involvement of private agencies. Lack of compatibility of use by the school and private owner is yet another constraint. Finally, there is the traditional view of the American schoolhouse, particularly upheld by the parents of students. To have their children attend school in a building that serves other functions has not been widely accepted by parents. Parents of college students may share this traditional view in terms of a campus and its buildings.

C.U. Brubaker Study, re-programmed 1960's high school

The objects of buying. Boards that have purchased buildings can put them to various uses. Obviously, one such use could be as an educational facility, such as a regular elementary or secondary school. Other buildings have been used for vocational or special education. Still other buildings have been purchased for special purposes, such as administration or athletics. As long as a purchased building meets construction code where necessary, it can be used for nearly any purpose.

SELLING

Rationale. Of the many reasons for a board to sell a building it owns, three are most likely:

(1) a change in enrollment,
(2) the age/condition of a building, and
(3) its retention as a capital resource.

When decline in enrollment is pervasive, the best course of action is usually the closure of one or more buildings; if decline is limited to a specific neighborhood or section of a campus, different decisions can be made. In

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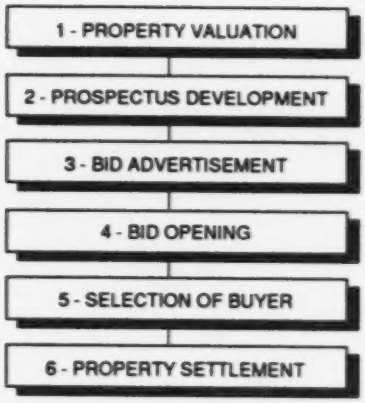
1 - PROPERTY VALUATION
2 - PROSPECTUS DEVELOPMENT
3 - BID ADVERTISEMENT
4 - BID OPENING
5 - SELECTION OF BUYER
6 - PROPERTY SETTLEMENT

STEPS TO THE SELLING PROCESS

either case, buildings can be identified for closure and sale.

The age/condition of a building raises two issues. First, the building no longer may be healthful and safe. Many states require these criteria to be met in a variety of ways, and a building, often because of its age and lack of proper maintenance, becomes too expensive to renovate into a safe and healthful condition. Second, the building may no longer support the educational program. Age usually will be a factor here also, and a decision will be made to abandon the building for sale.

These two reasons often work in concert. A declining enrollment can result in less demand for space that, in turn, allows divesting of old, unsafe, educationally inadequate buildings. A caution is offered here. Declining enrollment can indicate the closure of a building to be a sound management decision. However, given the successful closing, it does not always follow that the sale of the school is the best course of action. Future enrollment has to be considered in terms of facility needs. For the purpose of this unit, it is assumed that the decision has been made to close and sell a building or buildings. (The decision-making process is addressed in Unit C).

The third reason, as indicated, is concerned with the management of an educational building as a capital resource. Each building was constructed for a well-defined purpose. While the building is being used for its intended purpose, it is a capital resource to be valued. However, if a school district, college or university no longer has a use for a building, to retain it amounts to poor management of capital resources. It should then be considered as available for sale.

Process. The process of selling a building is well regulated in the various states and provinces. As a first step, a governing board will declare a building to be surplus based on appropriate demographic and facilities studies. They will then decide on the manner of disposition. Such action is usually taken in public session.

These steps may occur before the actual sale:
(1) property valuation,
(2) prospective development,
(3) bid advertisement,
(4) bid opening,
(5) selection of buyer, and
(6) property settlement.

For assistance in the process, it has become common to list a building with a realtor.

Property valuation is usually done by a qualified real estate appraiser. Some laws require that several valuations, perhaps three, be solicited from different appraisers. This is to assure that the owner will receive a price for the building that is at market value or close to it. The valuations are often confidential and may be used by the owner to establish the minimum selling price. Some prospects and/or bid advertisements will include the minimum acceptable price. Most potential buyers will have their own valuations done and will establish the value of their bids accordingly.

The careful development of a prospectus can enhance the sale of an educational building — in dollars bid, in the level of competition among potential buyers and in a quick turnaround time. The prospectus should cast the building in the most favorable light possible. It should provide information about the building's age, type of construction, heating-cooling plant, maintenance costs, general condition, degree of interior flexibility, historical value, site, neighborhood, zoning allowances (and zoning reservations), traffic patterns and other positive factors that truthfully represent the building. After reading the prospectus, the reader should want to visit the property and, ideally, submit a bid.

The bid advertisement often contains a summary of information offered in

the prospectus. It generally also contains some very specific information about the building, such as:

(1) location and zoning status,
(2) size,
(3) specific facilities included,
(4) site size including parking facilities,
(5) date and place of receipt of bids,
(6) date and place of bid opening,
(7) format of official bid document,
(8) minimum acceptable price,
(9) performance bond requirements, and
(10) a contact person of the owner.

The owner's attorney is a valuable resource in the preparation, review and even approval of the bid advertisement document. As previously indicated, states and provinces may differ but laws commonly require that advertisements be placed in a local, and sometimes a regional, newspaper at least two weeks prior to a bid receipt date. Experience has shown that the longer the period between bid advertisement and bid receipt, the more and higher bids will be received.

A bid opening is a common occurrence in school districts, colleges and universities. Bid openings for the sale of buildings present no new challenge. Bids received before the established deadline are opened, checked for inclusion of all requirements, read aloud, and accepted for review and later decision-making about the selection of the buyer. Staff experienced in managing bid openings should be in charge. Although it varies by practice, the presence of the bond attorney may be desirable.

An evaluation of the bids received will result in selection of the buyer. Selection criteria, established prior to the receipt of bids, should include such factors as:

(1) satisfaction of bid requirements,
(2) evidence of the fiscal solvency of the bidder,
(3) knowledge of the new use that the buyer has for the building relevant to its effect on the neighborhood residents or campus,
(4) adherence to zoning laws, and
(5) amount of the bid in relation to all others received and the announced minimum acceptable prices.

Of course, if the law of a given state or province requires that the highest bid for an acceptable reuse of a building be accepted, then that part of the bid evaluation is fixed. In any case, the owner has to accept a particular bid or reject them all. If the latter occurs, bids can be re-advertised if desirable.

Given the selection of a buyer, the only major step remaining is a legal settlement, or the transfer of ownership of the building from the seller to the buyer via an agreement of sale. This step requires the transfer of deeds and the payment of the bid price. The governing board of the seller is now free to consider how it will use the proceeds from the sale of the building.

Use of proceeds. As with all aspects of selling property owned by a governing board of a district, college or university, state and provincial laws provide the specific governance. There are a variety of uses to which proceeds from the sale of a building can be put.

A board, for example, may decide to use all or a portion of the proceeds to cover current budget operating needs. Also, it may decide to dedicate all or a portion of the proceeds to the revenues supporting the next fiscal year's operating budget. Both are sound uses for the proceeds. It is a common requirement in a school district that voters approve a transfer of capital funds to current operating revenues. A referendum is required except when a board of education is fiscally dependent on a municipal governing body, in which case that body can approve such a transfer.

Proceeds from a building sale also can be used to support other capital projects that are underway or planned. State laws should be carefully searched to determine whether the voters have to approve such use of the funds. It is

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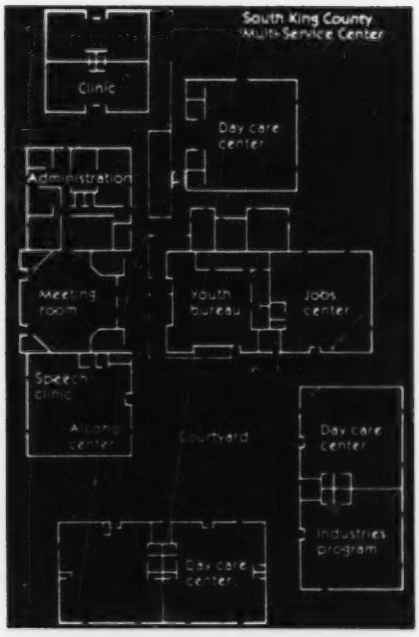
often argued, again in the case of a school district, that voters should approve all construction, even though a board of education may have amassed sufficient funds, because any new building represents an operational expense that will affect future budgets. Municipal government approval also may be required in this case, if the board of education is fiscally dependent upon it.

Owners also have the option of investing the proceeds from a sale. The earnings then can be applied to the two uses described above. The earnings, if sufficient, also can be helpful to boards of education in tax rate management by providing all or some of the annual operating budget increase. One specific dedication in this regard is the application of the proceeds to the reduction of the capital debt of the district. Many districts, for example, have been faced with such rapid enrollment decline, that buildings became surplus even before all debt on them was retired. Debt reduction is an acceptable use of sale revenues by colleges and universities, also.



Multi-service center

Marketing surplus schools. There are varied markets for surplus educational buildings. The seller is well advised to conduct a survey of these markets before deciding to sell a building.

Public agencies of many types have purchased surplus educational buildings. They have been converted to health and welfare centers, senior citizens centers, housing, municipal offices, day care centers, community centers and, in many cases, combinations of these functions.

Other educational organizations are often interested. Colleges and universities sometimes seek a public school facility in which to locate a satellite campus. Private and parochial schools are potential clients too.

The private sector, i.e., business, light industry or individuals, also can make use of a surplus school. Common reuses of educational buildings by the private sector include hotels or motels, office buildings, apartments or condominiums, restaurants, shopping centers and mini-malls.

The seller must consider the criteria a potential buyer will apply when deciding which building to purchase. The buyer will most likely pose a series of questions, including:

1. Will the building accommodate all space needs and programs?
2. Does the building have access for handicapped persons?
3. Are the building operating costs within an acceptable range?
4. Has energy retrofitting been done on the building?
5. Will zoning laws permit the buyer's program/activity in the building?
6. Will residents near the school agree with the new use of the building?
7. Is the site location beneficial to the buyer?
8. Is the general condition of the building satisfactory and not in need of immediate renovation?
9. Does the site have sufficient parking spaces?
10. Does the building lend itself to interior renovation?

If a choice is possible, selecting the building that satisfies these criteria should result in a quicker sale at an acceptable cost.

Objections. The discussion thus far has concentrated on an essentially straight forward process. However, the process is sometimes interrupted by objections from a variety of constituencies.

The residents of a neighborhood may object to the reuse of a school for non-school purposes. Its presence may have given them a sense of tranquility and security. They may conclude that a change in the use of a school signals an unwelcome change in their neighborhood. When neighbors do not object to the sale and reuse of a school building in general, they may have specific objections to such factors as different and higher noise levels, additional traffic load, night time use, type of population served, assumption/fear of lower property values and loss of a recreational facility.

Merchants, too, have objected to schools being put to different uses, especially if customers are lost or the new tenants provide competition for them.

College, university and public school students in several instances have raised objections to the sale of a building. Their reasons are varied and may include an emotional attachment to the school, and a belief that students displaced by the sale are being unfairly treated or that their neighborhood or campus will be adversely affected.

Parents, of course, have become the most vocal opponents to the sale of a school. Their opposition may have occurred earlier when the decision was made to close the school. They may object because of the neighborhood factors previously described or because of concerns about their children attending a new school.

Finally, the political power structure, or factors of the structure, may object to the sale of a school in a community. Its members can be quite vocal about raising the kinds of objections already discussed. They may argue that the school will be needed in the future or they may question the financial package the governing board has approved. Support for such a political constituency may result in a power block against the divestiture of a school building.

LEASING

Rationale. In the previous section, three major reasons for selling school buildings were cited. Two of these, declining enrollment and the age or condition of a building, also pertain to leasing.

It should be apparent that the difference between selling a building or leasing it rests on future needs as perceived by the owner. If the building no longer serves the owner's purposes, he sells. If the building is not now of use to the owner, but may be in the future, it might be wise to lease it rather than sell.

While some school districts and colleges/universities might argue against the closing of buildings in the face of declining enrollments, others are convinced that they have surplus space. Most debate centers on the use of individual surplus buildings. The very real problem, however, is the duration of the surplus. Will it be surplus ten, fifteen or twenty years from now? The overall school population trend, which has been on the downswing since the 1970s, appears to be on the upswing and will continue, according to estimates, through the 1990s. In the U.S. total population is expected to grow by more than one million a year for the next 67 years (U.S. Census Bureau). Although this trend will not mean an increase in all areas, these two factors are important for long-range planning and should be given consideration in the decision-making process. Should a school district or college sell a building and then need more space several years later, in retrospect, leasing may have been a wiser course of action. On the other hand, the condition of the building and changing educational needs may show that selling was the correct choice and that a new facility is warranted.

School authorities in both Canada and the United States advise that the decision to lease (or to sell), should come from a master plan that has ques-

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School recycled for apartments and shops

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tioned how surplus space might be:
(1) affected by Federal, state and provincial legislation,
(2) used efficiently for other educationally oriented activities,
(3) adapted effectively to suit future educational demands and clientele, and
(4) leased or sold to other educational and/or noneducational agencies.

Retaining ownership and protecting buildings. Once it is apparent that a district or college has to give up an educational facility or space as surplus, it must consider leasing as one of its options. If retention of ownership is desired, there are only two real alternatives: leasing or "mothballing." Boarding up a surplus building, ("mothballing"), can have a negative effect on surrounding neighborhoods or sections of a campus, for example, by inviting vandalism. Neighborhoods and campuses tend to retain their character when buildings are kept in operation, for education or other purposes.

Potential users. While some potential purchasers might be more willing to lease, the opposite is not necessarily true. For example, educational institutions or agencies other than an owner with surplus space might be in a better position to lease space needed than to make an outright purchase. This is especially true since little, if any, major renovations are needed to make the building fit the "new" activity, which essentially should be the same. If renovations are required, they usually are done at the cost of the lessee.

If fact, where long-range planning and attention to trends suggest a future need to return the building to its original purpose, it is much easier to take back the building with basically the same space configurations and design as it was prior to leasing. The lessee is often held responsible for returning the building to its original configuration.

Consideration also might be given to partial leasing, which involves organizing surplus space by each floor or wing of a building and then leasing the space for uses compatible with the school's program. Whether leasing with the idea of future reconversion to a total or partial educational facility is possible or desirable would depend on local conditions and long-range planning data.

Policy suggestions. A study of policy development conducted in the Arlington, Virginia, public schools indicated that policy development passed through three periods: a period of preparation for an uncertain future, a time of issue clarification after enrollment decline was accepted and consolidation of schools began, and a time of implementation of the policies that had been consolidated into a single set of priorities and procedures recognizing school and community interests.

The Grand Rapids, Michigan, public school district recognizes its responsibility to provide maximum use of its real properties. It maintains a real property inventory containing current use records of all district property and it identifies property that is underused or no longer needed for district programs. This information is reviewed periodically. The superintendent recommends sale, lease or disposition procedures for underused or un-needed real property. One regulation adhered to is the use of a public informational meeting to explain the proposed disposition of a specific piece of property and to receive comments.

It should be evident that specific policies related to leasing of buildings no longer needed for educational use must be formulated around the total needs of the community. This can only be accomplished after careful analysis of data and consideration of the appropriate input.

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THE EDUCATIONAL PROGRAM AS LESSEE

Rationale. Governing boards and colleges/universities may consider acquiring space by leasing, once they have determined that additional facilities are needed. (There is no such need, of course, in areas still experiencing enrollment decline).

One reason for leasing instead of building is that it might be less expensive on an annual basis. A developer may be willing to provide a building that meets code if conditions are right for him. Such conditions include: interest rates, the need for long-term tax relief, the cooperation of a board of education or board of governors, the existence of a suitable and approvable site, and other more specific factors such as the content and length of a lease to which a board will agree and which state law will permit. Although it is not common practice for states to permit long-term leases, special-purpose legislation has been used to address this issue.

Another reason for leasing a facility instead of building is that the need for space may be short-range, e.g., less than ten years. Such a condition will affect the willingness of private developers to invest in the construction of educational buildings. In some states or provinces surplus schools in one district may be available on lease to others in need of space. Or specialized facilities, such as auditoriums, swimming pools and other recreational facilities, may be leased from private, non-school firms. School boards that are fiscally dependent on the voters also may have to lease because of the refusal of voters to approve funds for capital construction. A similar condition may exist for institutions of higher education that are dependent on state legislatures.

Two other reasons for the leasing of facilities were previously alluded to, namely, a lack of capital funds and the choice of the best budget strategy. Governing boards may indeed face a lack of capital funds. This is, of course, most often caused by a lack of voter or legislative support. Or voters may have given significant support but the board may have reached a legislated limit on debt (such limits exist in a number of states). In this case, the board cannot legally submit to the voters a request for more capital funds. Assuming that additional facilities are still required, leasing may be the best alternative available.

The question of a best budget strategy is a related issue. In a real sense, a lack of capital funds makes budgeting for a lease the only strategy. However, the amount of aid received from outside the school district, usually from the state level, may be balanced in favor of current operating expenses of which funds for leasing are a part. If this is the case, leasing is a viable alternative to the traditional capital funding of school facilities. On the other hand, some regulations forbid the application of state aid to the leasing of facilities. The state aid loss usually results in a higher amount of local funds being raised through taxation. It is easy to see that a knowledge of state laws and regulations is essential when a budget strategy is being decided or when capital funds are lacking. Colleges and universities also may face a lack of capital funds and may have to rely on alternative funding sources.

Constraints. Constraints to leasing may exist, depending upon the state or province. For example, leasing in some locations is not permitted by law. The prohibition is often generated by concerns that leased properties will not adhere to construction codes and thus will be unsafe. In other instances, leasing may be permitted on a case-by-case basis. Usually, separate enabling legislation is required for each case. It is generally accurate to say that the satisfaction of code is the most important constraint that has to be overcome if leasing is to be permitted.

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The lessors. Several agencies can lease facilities to educational institutions if the constraints are overcome. Units of government—local, state or federal—can lease surplus, or even new, space to governing boards. Private developers will build and lease facilities, especially if the lease is for a term that is advantageous to the developer. The design-build firm, as a special type of private developer, will provide leased space. These private lessors, being essentially business-oriented and profit-motivated, may enter into a lease-purchase agreement (discussed later) if a governing board desires one.

Another lessor, although limited to the states where it is legally constituted, is the bonding authority. Based on the needs of a district or campus, the authority sells general revenue bonds and constructs a building or buildings. It then leases them, usually on a lease-purchase agreement, to a district or college/university. Then, from regular and/or capital budgets, including state aid where applicable, the authority is paid an amount annually until the revenue bonds are retired. The district or college/university is given title to the school building upon the retirement of the bonds.

Lease-purchase agreement. A specific lease action resulting in the acquisition of facilities is the lease-purchase agreement. Usually, such an agreement cites an agreed-upon total cost of a building, the payment schedule and the point at which the building becomes the property of a governing board. Funding an agreement of this type involves the same financial considerations previously discussed.

In terms of cost, there is probably no particular advantage to the lease-purchase agreement. Some buildings, if constructed by a developer who is involved in large amounts of construction, may be slightly lower in cost. Others may equal the market value.

Though the payment schedule is negotiable, it is influenced by the lessor, who is providing the funds for construction. The length of the agreement is not unlike regular payback schedules. It varies according to similar criteria such as the speed with which the investor wants to be repaid, the annual payback amounts that boards can appropriate and the necessity for boards to consider tax rate management and/or annual state appropriations.

Regulations governing lease-purchase agreements also vary. Some states have a prescribed form and require approval of an agreement by the commissioner of education or higher education, or by the attorney of the state or province. Others have special plan and code reviews to assure that the building being acquired meets the construction code of the state.

During the life of the lease, it is common practice for the building to be treated like it is owned by a governing board. The board assumes complete responsibility for operations including maintenance and insurance.

A
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Acoustics I10
Acquisition of Land L5
Activation O2
Adaptability N3
Adequacy and Efficiency D23
Administrative Costs L5
Administrative Offices H7
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Aerial Photographs F4
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Appraisal, Program C9
Appraisal, Site C9
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B
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Educational Planner D10
Educational Program E8
Educator/Planner B3
Elementary Schools G3
Energy Conservation Engineer F4
Energy Savings K6
Engineers B7
Enrollment Study C4
Environment, Effect on Behavior I3
Environment, Institutional I3
Environment, Social I3
Environment, Physical I2
EPA F5
Equipment, Bid / Purchase J7
Equipment, Quality J6
Equipment, Suppliers B8
Equipping, Budget J3
Equipping, Classrooms J4
Equipping, Timing J3
Equipping J2
Equity and Equality D22
Evaluation C8
Evaluation Instruments C10

F
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Facility Planner D10
Faculty D13
Faculty Space H6
Federal Agencies F5
Federal Aid L6
Federal Government Agencies B11
Fees and Planning Costs L5
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Fine Arts G9
Food Preparation H4
Funding Q2
Funding Construction C11
Furnishing and Equipment L5

G
Grading F11
Guidance and Counseling Offices H7

H
Health Center H8
Heating / Cooling I14
Highway Maps F5
Historical Significance N4
Home Making G18
Housing C5

I
In-house Architect D11
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Instructional Areas E8
Instructional Staff B4
Insurance Costs L5
Interest Costs L9
Interior Designers D19
International Agencies B12

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Leasing, Policy ... Q8
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Lessor ... Q10
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Payments ... M6
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Physical Education ... G15
Physics ... G15
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